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Index to Advertisers—Page xlii.

Principal Contents:

	PAGE
Switchgear Mass Production	661
Improving the Electricity Meter. By G. E. Moore	663
The Commercial Motor Show	665
A Rolling-lift Bridge	667
Up-to-date Theatre Lighting	668
Electricity Supply Progress	669
Vibration in Overhead Lines	670
Meetings and Discussions	671
Correspondence: Scotching a Libel; Earth Leakage Trips; A.C. Motor Protection; Inductor Speedometers for London Tubes; Single-pole and Neutral Gear; A Curious Fault	673
New Apparatus and Devices	675
A Flourishing Industry	677
Some Promising African Markets	678
Parliamentary News	679
Business and Industrial Notes	680
Electricity Supply	683
Contract Information	687
Notes	688
Our Personal Column	689
Financial Section	690
Published Specifications	693
Work for Contractors	694

Industrial Planning

IN his speech at the B.E.A.M.A. dinner last week Sir Samuel Hoare, the Home Secretary, castigated those who go around gloomily predicting an imminent slump. We agree with him that such forebodings are to be condemned, for it is possible for the world to talk itself into disaster without making adequate efforts to avert it. It is prudent to prepare for leaner times; nobody reproaches the man who insures against possible misfortunes.

We must not refuse to learn the lessons of experience. It has been an unfortunate feature of our industrial system that booms have been followed by periods of depression. This has been accepted as inevitable, but it is conceivable that, if it cannot be avoided entirely, something could be done to mitigate the consequences. This would involve some form of forward "planning." Sir Samuel was somewhat caustic regarding planning (no doubt with some reason), but Sir Felix Pole, a little later, proclaimed himself an inveterate believer in planning, which, after all, is only an exercise of intelligent foresight, and surely an essential in business. Sir Felix said that it should not be beyond the wit of man to prevent abnormal prosperity as well as abnormal adversity.

There is no doubt that an industry, like a long-distance runner, is more likely to be successful if it makes steady progress than if it proceeds by feverish rushes followed by crawling periods.

If the electrical industry were entirely self-contained it might be possible to get the various trade associations together to co-ordinate supply and demand to some extent. The primary demand, however, is from the country in general. In times of prosperity, with more money about, the electrical industry finds more customers for consuming appliances in the industrial, commercial and domestic spheres and it has to "deliver the goods" as required. Thus it is difficult to pursue an even course.

The late Mr. J. A. Crabtree, who gave much thought to this problem, showed in 1930 (ELECTRICAL REVIEW, May 9th, 1930) that he found it possible to forecast the demands of the home market with some degree of accuracy, although he had discovered no satisfactory method of "budgeting" for export sales. There are possibilities in this form of "market research" to cover short periods, but the long-term problem is not capable of such a simple solution. Our industry, like most others, is affected by constant changes in design and stocks might soon become obsolete. And, in any event, without some very drastic form of control there would be no assurance of an ultimate demand for them. Then, again, Mr. Crabtree's remark regarding the difficulty of foreseeing the future of the export trade introduces the international element, which further complicates matters.

Should the industry, then, resign itself to the inevitable? Is there not some direction in which co-ordination can help to smooth out the load curve? We think our leaders and their expert advisers should together be able to indicate it.

The advance of electricity has been fairly steady during the past few years and generation is being concentrated in fewer stations. Surely there is scope here for some form of "budgeting." The extension of plant is subject to the consent of the Electricity Commissioners. Was it in the mind of Sir Felix Pole that they could work out a scheme in conjunction with the heavy plant manufacturers so to spread production as to procure a steady load on the factories? May this be regarded as a typical working hypothesis? Some such suggestion seemed to be implied, and Sir Felix definitely described it as the duty of the Government to call the interested parties together to discuss the question of planning generally. As an influential member of the Government was present on the occasion, we may hope that his remarks will have effect.

Maintaining Exports

SPEAKERS at the B.E.A.M.A. dinner naturally made reference to the necessity for fostering electrical export trade. Sir Samuel Hoare warned manufacturers that once overseas clients were lost it might be years before they returned. Sir Felix Pole stressed the necessity of a sound home market if manufacturers were to be able to quote prices low enough to meet foreign competition in overseas markets. The Board of Trade returns show that export trade is being maintained in spite of the increased demands of the home market. During the first nine months of this year the total value of electrical exports was 28 per cent. above the figure for the corresponding period of 1936, which is a good showing even when allowance is made for the higher price level.

London Students

ACCORDING to Mr. J. E. Ball, hon. assistant secretary of the London Students' Section of the Institution of Electrical Engineers, the attendance at meetings of the Section held during 1936-37 was not so good as it might have been. He tells us that this year special efforts are being made to encourage members to participate more frequently in the Section's activities, and it is hoped that a revival of interest will be shown in the programme that has been prepared. To-day (Friday) there is a smoking concert at the White Horse Hotel, High Holborn, preceding by a week the opening meeting, when Mr. N. C. Rolfe, the chairman, will give an address entitled "Frequency Control and Measurement of Radio Waves." At subsequent meetings papers will be read on public speaking for the engineer, electric-discharge lamps, testing telephone instruments, and administration. The annual dance is to be held on December 10th and a series of interesting visits is being arranged.

Another Gas Danger

DURING the recent air-raid precautions rehearsal in the Chatham area every electric light was switched off immediately the alarm was given. By this time the gas lamps had been extinguished, too, for the lamplighters had been going round for half an hour or more putting them out. This is distinctly not good enough, for in actual emergency there will probably be much less than half an hour's notice of the approach of aircraft. Again, the restoration of the lighting as soon as possible is imperative, so that on both counts it looks as though electric lighting is essential to the success of air-raid precautions.

Resistivity of Water

THE paradox that while "pure" water is practically an insulator, any water, however clean, that is ordinarily met with is regarded as a good conductor is, of course, an old one. Even to distilled water values of resistance are given that are many times less than those ascribed to perfectly pure water. An addition of minute quantities of substances (which may have negligible conductivity before being dissolved) has an enormous effect in decreasing the resistance of the water. This effect is heightened by the greater area of intimate connection between two other conductors that is provided by a film of moisture. Measurements of resistance made by different observers vary within wide limits, and a correspondent raises the question as to whether accurate results can be obtained by ordinary methods, as some degree of electrolysis occurs with the passage of test current and the slightest decomposition of what, in effect, constitute electrodes vitiates the results.

A Useful Museum

ACCOMMODATION at the Science Museum, South Kensington, is clearly becoming more and more inadequate for a truly representative display to be made of scientific developments. Even if the present space were trebled, in accordance with the suggestions of a Government committee in 1910, this would not go nearly far enough towards meeting the needs of the future—needs that will be cumulative as research continuously opens up new fields. Appreciation of the value of science to trade is shown by the Federation of British Industries, which, at the instance of Dr. A. P. M. Fleming (who represents it on the Advisory Council of the Museum), has written to the President of the Board of Education strongly supporting the recommendation of the Council that the whole of the site bounded by the eastern wall of the existing block and by Exhibition Road, Imperial Institute Road and Queen's Gate should be finally allocated to the Science Museum. The practical significance of this is that this museum does more than collect apparatus for providing an historical record of scientific progress. It also demonstrates the most recent applications of the products of science to everyday life by means of temporary exhibitions that have proved of value to an interested public.

The Dividing Wall

THE significant points about the fire at East Ham grid sub-station on November 4th, which was caused by the liberation of burning oil due to the breakdown of a 15,000-kVA, 66/6.6-kV transformer, were that damage was confined to a small area and that supply was quickly restored considering the circumstances. The restriction of the effect was due to the fire-protection wall. Although the upper part of the wall was eventually demolished by the heat generated, and in falling caused external damage to the second transformer, it seems clear that without it the consequences would have been far more serious. The occurrence illustrates, as a general principle, the value of both physical barriers and space as a means of guarding against the effects of fire. That the a.c. supply was restored within fifteen minutes *via* the disused trunk mains from West Ham power station indicates the kind of practical co-operation between the staffs of different undertakings in an emergency that can usually be relied on.

Heart or Lungs?

MEDICAL evidence given recently at a Liverpool inquest regarding a fatal electric shock received in a bath attributed death to cardiac syncope. This is claimed to prove the correctness of the view generally held in this country that the cardiac centre, and not the respiratory system, is first affected by electric shock. The second view is said to have been favoured in French medical circles. This is interesting enough as a technical point, but the important thing is whether our medical friends can apply such knowledge to any useful purpose.

Electricity Supply Records

WHILE an advance of 13.3 per cent. in kWh generated in 1936-37 over the previous year is a good showing, in that it follows four years in which the compounded rate of increase has been over 12 per cent., a corrective to complacency is to be found in the latest annual Report of the Electricity Commissioners, which is reviewed by us this week. The extent of development varies very widely as between undertakings, and not always for easily accountable reasons. It is clear that much remains to be done, as not only are some 5¼ million premises still without electric services, but those that are connected to the public supply should be consuming more than they do. Activity by individual undertakings is illustrated by loans exceeding £1,750,000 each in two cases and exceeding £500,000 each in ten cases. In these the bulk of the money was needed for extending generating stations, but for municipalities as a whole the allocation for distribution was probably quite half of the £24 million sanctioned (itself half as much again as the average amount for the past sixteen years), taking into account a proportion of the sums allowed for plant provided in sub-stations and for "other purposes."

Switchgear Mass Production

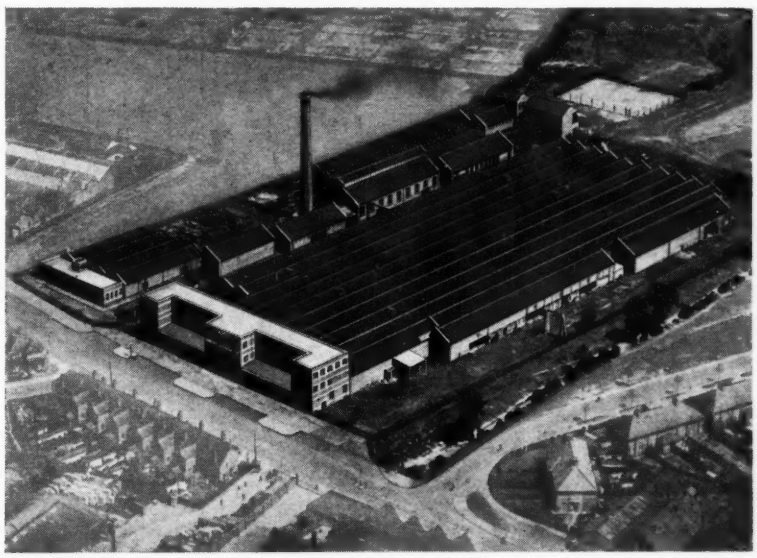
The new M.E.M. works

Studied spacing of operators and timing of the various processes ensures a steady and continuous production

WE gained an idea of the size of the new works at Birmingham of the Midland Electric Manufacturing Co., Ltd., when looking with Mr. T. Birkett, general manager and director, over the three acres of roof of the main building from the upper floor of the adjacent office block. The offices are at one end of the building and present a frontage to Reddings Lane of about 265 ft.

Before we left the offices to tour the works we were shown "all we make" in a display in the committee room. While such efficient large-scale production seems to demand a fairly limited range of products, between the 15-A 250-V "Memette" and the 200-A 500-V "Glasgow" switch-fuses there appeared to be something for every purpose. And so with the simplified motor starting gear.

To us the works appeared as a whole as one vast and efficient machine. But lest such a picture should convey to our readers a false idea of the policy of the company, we wish first to mention the pride with which Mr. Birkett showed us such results of the directors' consideration for employés' welfare as the well-appointed canteen which will seat 500, and the playing fields and pavilions all within the 14-acre site. But such genuine pride could not be expected to equal that which he has for the "machine" which he will leave in good running condition when he retires from more active work at the end of the year.



An aerial view of the M.E.M. works, Tyseley

From 30 to 35 tons of finished products leave the works every day almost as soon as they are packed, and as this huge quantity is produced on the continuous-flow principle, with every operation precisely timed to feed the next one, it is easy to understand the firm refusal of the executive to depart from the designed process programme under any consideration. To facilitate the continuous-flow working, which necessitates the reception of raw materials at one end of the building, there is a wide, well-made road which, with the public road at the front, completely encircles the main building.

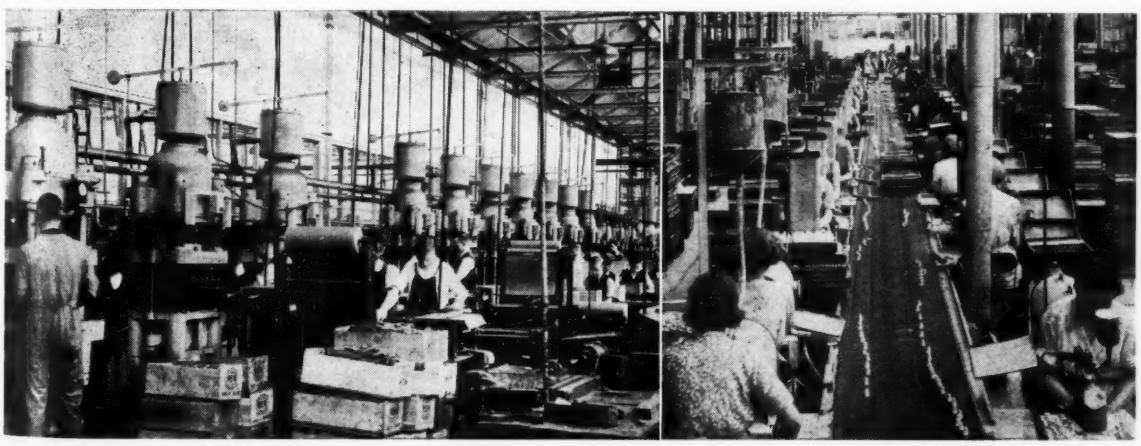
Probably the fact that nearly all the operations and departments are "dovetailed" together under the one roof of the main building helps to impart the idea of the works as one machine. But there is one important exception—the foundry. This has a building to itself, but it is so situated just across the road on one side of the main buildings that the castings "flow" into the main stream for assembly at just the right point at the correct time.

The foundry plant is now being extended; at present it has an output of 50 tons of castings per week. At the front of the foundry pig-iron, coke and limestone are elevated by means of skips to the tops of the two air-blast and coke-fire cupolas.

The moulds are made in an imposing battery of magnetic (British Insulated Cables, Ltd.) hydraulic moulding machines. In the former type sand falls from a chute to the bottom section of the mould, the pattern is swung round by the machine and the top section of the mould is put on the pattern and is then similarly filled. A squeeze effected by a solenoid, or by hydraulic pressure as the case may be, in the bottom of the machine then "makes" the mould ready for casting.

Continuously moving tables on an endless conveyor receive the moulds, which are poured while they are in motion, the operative keeping up with them. By the time the castings reach the appropriate point of the conveyor circuit they are cool enough for mechanical handling. Big castings are pushed with their moulds on to a shaker table through the grating on which the sand falls, while the tables carrying smaller work tilt and discharge the castings and sand on to a conveyor-elevator in a trench.

On the journey up the incline of the elevator the castings are "picked out" and the sand passes on to reconditioning plant where it is milled and watered. This section alone has sixteen incorporated drives with central control. After treatment in fettling barrels the castings are prepared for enamelling by a comprehensive battery of bench grinding machines. Compressed air and hydraulic power are in great demand at the foundry, and for these services there is a well-equipped "power house."



Left: Presses producing moulded and laminated insulation material. Right: Porcelain assembly conveyor

Castings enter at the side of the main building where they are drilled, machined and enamelled before they join the main "process stream." To mention just one of the many machine-shop operations, we saw castings held by pneumatic grip while they were drilled on three sides simultaneously. Belt conveyors feed the castings to various operation points and finally to the enamelling plant. Hung on continuous conveyor racks the castings are dipped, drained and dried in an oven—moving all the time. From the oven they pass to the assembly lines where they meet the other components.

The completely mechanised foundry

These can be considered broadly as in three classes—light metal parts such as terminals and contacts, electrical porcelain bases and bridges, and bakelite cases and covers. From the light metal stores rods, bars and coils are fed to the machining section where the adaptability of the modern "automatic" is most marked.

The Pottery

It was later when we saw how greatly the porcelain shrinks in the kiln, and when we watched the jig-assembly of the metal parts in the porcelains that we fully appreciated the advisability for the company to produce its own porcelain. Mass production is dependent upon precision. Clay and the other ingredients from the store are mixed with water in the revolving beaters or "blungers," and the slurry is pumped through compartment-type cloth filters. When the filter is opened by a rack the clay drops out in the form of plastic sheets which are dried in an oven. The dried clay is then ground to a powder and mixed once again—this time with *known* quantities of water and oil. But the mixture is still dry enough to approximate powder formation, and "consistency" is obtained by various sieving operations.

General assembly with eight parallel moving belts

Continuous flow is afforded throughout these processes by correctly timed transit *via* screw conveyors, bucket elevators, and a silo which feeds the mixers. Finally, a belt feeds the many chutes which serve the various presses. Some of these are worked by hand and others are hydraulically operated, while in the case of automatic machines the operative's job is just to keep the mould fed with clay and to remove the pressings. The oil mixed with the clay is for the lubrication of the press tools; the oil escapes later in the kiln.

After being dried in a special chamber—a long-hour process—the pressings are ready for fettling on small individually driven soft felt belts. Glazing is the next process, but this has no electrical value apart from cleanliness. We saw fuse bridges undergoing searching examination to ensure that the holes were not filled with the glazing fluid and that there was no glaze where it was not wanted—at the point of "grip" of a nut, for instance.

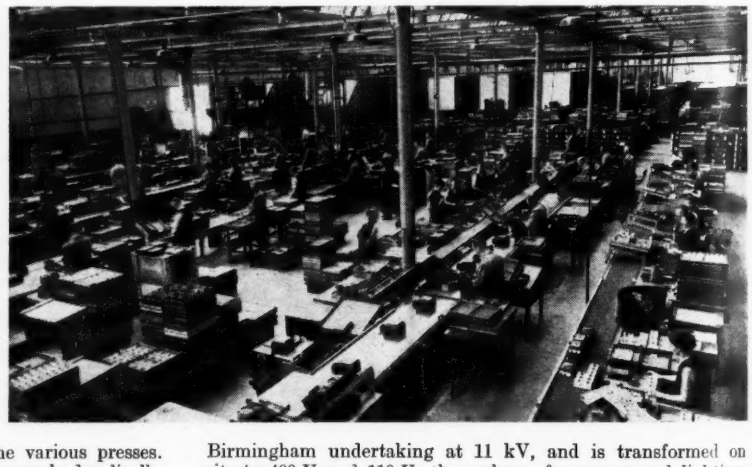
The porcelains spend from 24 to 36 hours in the kiln. The latter is of the tunnel type, 130 ft. long, and has a firing chamber at the centre and heating-up and cooling-down chambers at its opposite ends. The ware travels through on trucks at about 2 ft. per hour. The maximum kiln temperature is 1,265 deg. C. The temperature at three points is recorded by Cambridge equipment which controls the motorised valves at the gas and air inlets to the firing chamber. After inspection the fired porcelains are passed to assembly.

Apart from the moulding of such components as the bakelite switch cases and covers and push-buttons for starters, we saw switch rocker arms built up on steel rods from bakelised paper. The platens of all the bakelite presses are electrically heated, and this is an important contribution to the precision and threefold control scheme for temperature, pressure and time. Thermostats maintain a platen temperature of 350 deg. F., and the pressure is 100 tons per 10-in. ram. The elements are of nickel-chrome and metal sheathed, and the loading per pair of platens is 5 kW. Efficient hydraulic-power and compressed-air services are provided for the bakelite plant and the pottery.

Metal castings, light metal parts, porcelains and bakelite mouldings all find their way to the line, roughly across the factory and two-thirds its length from the raw materials end, where assembly starts. There are eight main assembly belts, and their speeds are so accurately timed and the apparatus so carefully spaced as to permit the essential continuity of flow. The lay-out of the components about each operative to reduce time and effort to a minimum is the result of much consideration on the part of a special motion-study staff.

The jig assembly of metal parts into the porcelain, the push and pull motion to give the directional control of the tap and threading by the peripheral direction at either side of a motor-driven friction clutch, the triple-concentric formation of thermal-release units and starters (first bi-metal strip, then asbestos tube and then the heater coil), and the sealing of screw-head holes by means of electrically heated wax pots, are but a few of the many things we noticed when walking along the assembly lines.

The total power load of the works is about 550 kVA, the total lighting load is about 170 kVA, the average power factor (excluding lighting) is 0.65, and the average load factor is 35 to 40 per cent. Most of the 250 motors (totalling 850 h.p.) are served by the company's contactor-pattern starters for remote and sequence starting control. Energy is received from the Birmingham undertaking at 11 kV, and is transformed on site to 400-V and 110-V, three-phase, for power and lighting. A glass-bulb mercury arc rectifier provides a 440/220-V d.c. supply, and a 400-V static balancer serves for a 230-V a.c. supply for the bakelite press heaters.



Electric Cooker and Utensil Design

Writing in the official organ of the American Institute of Electrical Engineers, Prof. W. J. Seeley, head of the department of electrical engineering, Duke University, Durham, N.C., states that in the not-far-distant future a complete electric cooking range will include the utensils which are to be used with it. These utensils will be of such diameter as to cover the unit completely, and will have black bottoms and square corners, although square-cornered utensils are difficult to clean. A minimum of surface units will be built into the range, however. Most of them will be the well-type of unit, such as is now included in modern ranges as an "economy" unit. It is also likely that surface utensils and their covers will be insulated against heat radiation from their sides and tops. There is the possibility that some day immersion units will be adapted to boiling and stewing operations, thus raising the efficiency of heat transfer to the highest possible value.

Improving the Electricity Meter

A survey, in the light of experience and research, of factors favouring long, accurate performance

By G. E. Moore, A.M.I.E.E.

AS a result of the Electricity Supply (Meters) Act having become law in 1936 the State is to compel electricity undertakings to employ generally only such energy or quantity meters as have received the Electricity Commissioners' approval. These meters must be tested by approved apparatus and methods and comply with the newly prescribed limits-of-error regulation, in order that Government examiners may certify them for use.

Although a meter must be of an approved construction, there are certain details affecting future performance which cannot be judged in any absolute manner, and its declared precision is, of course, merely that at the time of acceptance test, which is as far as the State's interest is manifested. As soon as the meter has been passed for service, however, internal changes continue or begin. These changes can be physical, electrical, magnetic and chemical. They may, individually, have but a negligible effect upon the meter's rectitude, or they may be serious, and yet to some extent counter each other's ill-effects.

[*James Riddell*
Mr. G. E. Moore

By careful design, choice of material, and manufacture changes should be rendered insignificant over a long period and effective stability in the full sense made almost inevitable. This happy state should be achieved in each meter and not in the bulk as evidenced by averaging the life performance of a host of meters. The real test of every meter is its ability to maintain its accuracy. Utter stability in all senses is the ideal. To this end there has been, during recent years, a marked intensification of interest and efforts. The lower rotor bearing, for example, has received a vast amount of attention throughout the world, the most diverse factors emerging. There are many considerations (not all concerned with its paramount duty) which relate to the improvement of the electricity meter.

Modern knowledge and mass-production methods have given us a product that is truly amazing in value, but there is a marked tendency to force it through the factory and out into the user's hands too quickly. The ill-effects are discernible in various ways. Inspection, which should be treated as a dominant works "process," may not be thorough throughout. Moreover, not merely must the fashioning and assembly of parts be checked (and rechecked by another method and inspector, if possible), but continuous examination of raw material and of made parts supplied to the works should be carried out.

Fashions in Meters

Again, perhaps under the stimulus of competition and because of a "latest craze" (for there are fashions even in the meter world) designs, parts and processes are too easily altered or new ones put into use. Doubtless the State's future insistence upon approval or reapproval will act as a brake. During recent years there appears to have been an increase in chemical treatments and, unfortunately, of meter parts that in service suffer from disintegration or the like owing to the agents not being rendered inert.

Meters are, on the whole, freer from vagrant ("foreign") matter than earlier apparatus, but in the latter one had larger clearances, and could, for example, allow for the disc being somewhat low in the braking-magnet gap and reduce the possibility of a hold-up due to foreign matter on the disc. Nowadays, clearances are smaller and bearings in various ways improved, and it is, therefore, all the more regrettable that unclean or unstable finishes and materials should be employed. No new treatment ought to be adopted until months, if not years, of experience show it to be utterly reliable, and works processes should then be regulated with the utmost care.

The general construction to-day is, on the whole, robust and well-knit. Part of the improvement in this respect is due to assemblage by machinery, and though maintenance may be rendered more difficult one feels that the meter's reliability is improved. New designs should, like new treatments, pass through a prolonged trial period. One notes a certain amount of misplaced and even impetuous ingenuity in design work; the tried and trusted meter, however, is rarely changed in any sense and "spares" difficulties are thus kept at the minimum.

In spite of early fears concerning the all-insulated meter's toughness and rigidity of element-mounting the shockproof meter* has triumphantly established itself; so far as the case is concerned, age changes are non-existent and positive assurance against electrical shock is a very important gain. The ingress of dust and moisture at window and cover-gasket is always serious. The window-glass should be so positioned that movement is impossible and its adhesive (which in any case should be effective) thus aided. Windows, too, are in some cases unnecessarily large, damage and lost kWh (pending attention) being more likely as a result. Registers, by careful manufacture and suitable choice of materials, are almost frictionless; gearing-ratio faults have still to be completely absent in delivered meters; and there is a case for the admittance of the modern cyclometer type to B.S.I. favour.

In general, torque is well above the B.S.S. recommended figure, and nominal full-load speed is usefully reduced below 30 r.p.m. Both have their special benefits, but these can be offset by too heavy a rotor. Such factors, together with low losses, efficient anti-creep device, small temperature effects, and so forth, put the designer to-day upon his mettle.

The Lower Bearing

That vital part, the bearing which sustains the rotor, has always received a large share of the attention given to the meter, but during recent years the interest displayed has been extraordinary and it may be added that the number of factors involved is extraordinary, too. In its most popular form the lower bearing consists simply of the rounded glass-hard steel pivot of the rotor spindle running in the cup of a sapphire jewel (generally synthetic), but there has always been belief in the steel ball and one-jewel and jewel-ball-jewel arrangements and in the use of diamond jewels for important apparatus. Steel has recently been challenged by cobalt-tungsten, and possibly will be superseded; the jewel and the kind of jewel seem to have an assured future.

Efforts have continuously been directed towards achieving a bottom bearing that will have negligible friction throughout a lengthy service period. Experience and research (research sometimes merely explaining effects which experience had already found) have shown that certain simple and necessary conditions are readily met. For nil deformation of pivot there are known data connecting pivot curvature, rotor weight and jewel cupping; one can make calibrated pivots of standard maximum hardness; microscopic examination is necessary to ensure that utmost polish of bearing surfaces exists; jewel and pivot *each* must be above suspicion to form an efficient bearing pair; cleanliness of the parts and shielding from foreign matter are vital; impacting of pivot on jewel must be prevented at all costs.

To lubricate or not to lubricate? Years ago some engineers considered that, especially when a clean well-polished bearing pair and light rotor were employed, dry running was preferable; others favoured an oiled jewel or an oil-wiped pivot. Excellent—even astonishing—results were often fortuitously obtained. It was not appreciated that already, in the form of a natural grease film, lubrication already existed and that, if the bearing surfaces had been really "clean," static friction would be increased several times. It is now known positively that the addition of oil is beneficial provided the oil remains in place, does not chemically alter, is of suitable viscosity and will give at least a few years' service.

The function of the oil is in part to renew the inter-surface grease film and also to protect this essential film (that is probably at least monomolecular in thickness in spite of the heavy specific pressure) from destructive water vapour. Though there may be a comparative absence of surface roughnesses (by high-polishing) and a microscopically thin and active layer of oil, wear must still ensue owing to the molecular

* Vide "Shockproof Supply Services," by G. E. Moore, ELEC. REV., December 16th, 1932, and February 21st, 1936.

attraction fields; a relatively large amount of oil will reduce obstruction by floating any wear debris away from the bearing surfaces in the later working life of the bearing—a third duty for the oil.

It is clear that oiling, not "lubricating," is required; there should be applied as much of a suitable meter oil as the bearing will hold under all conditions of handling—aided if need be by prior anti-creep treatment with epilame or the like at all appropriate edges. An addition of colloidal graphite to the oil may be beneficial, but obviously in this use for a graphited oil there are factors which do not exist for large and high-speed bearings (the usual application). Research would prove the matter.

Perhaps the most interesting and significant discovery during recent years has been this: that if the jewel is cut in a particular *determinable* orientation, friction remains at a small value compared with that for any other cut. The optic axis of such a jewel is between 80 deg. and 90 deg. to the jewel axis. The effect might be likened crudely to the presentation of the rough grain rather than the smooth face to the pivot. Doubtless, the cohesive effect due to the molecular attraction fields of pivot and jewel is varied by the orientation, and probably when one was wont in the past to ascribe rapid wear to softness of jewel (or rough pivot), to marvel at the excellence of a hard-worked jewel or to puzzle over the misbehaviour of an occasional diamond, the real reason concerned the crystal structure. "Oriented-cut" jewels are, therefore, indicated for all jewelled bearings, and there is no economic or other reason why jewels cut in *any* fashion should not be completely superseded.

The Braking Magnet

Now that a very much more dependable lower bearing can be adopted a significant situation is presented. The magnet for the necessary braking of the rotating disc nominally has a "permanent" flux. Made of high-grade tungsten, cobalt, chrome or "Alnico" steel, with short magnetic circuit and small air-gap, it is formed, hardened, magnetised and artificially aged—being then regarded as of stable magnetic strength. But for one or more reasons (and apart from local disturbing effects in service) it may weaken, or (a less likely failing) strengthen.

Owing to frictional effects generally due to lower-bearing wear, the fall in low-load accuracy can at small and moderate meter loads offset the rise in accuracy caused by the diminished braking; on a register indication over a long period the error may not be serious. If the meter load is high, or frictional effects remain negligible, a weakened magnet may cause an error against the consumer of several per cent. Unfortunately, one cannot, at the present time, positively assure oneself as to the permanency of each braking magnet, and now that lower-bearing and general friction may be rendered unlikely, magnet instability is, naturally, more serious than ever.

In spite of certain improvements in modern magnets there is reason to believe that the works processes (particularly stabilisation treatment) are sometimes hurried and not utterly reliable. The fact that a meter is "approved" and "certified" has here no practical "life" significance, for even if the kind of steel and manufacturing principles were beyond doubt, works mistakes occur. It is perhaps heterodoxical but nevertheless true to say that a used meter, perhaps of unapproved and unapprovable design, may on account of a long period of ageing in service prove after overhaul more dependable than a new meter, its braking-magnet having "settled down" and its bearings, especially any jewels, possibly showing good survival properties, too.

I would urge that the following steps be taken to make conditions more certain. First, the best kind of steel and most reliable and complete processing should be found and imposed. Secondly, the double rather than the single braking magnet assembly should be favoured. Thirdly, as there is much merit in the old-fashioned storing of treated magnets for long periods and then retesting for stability before putting into use, magnets should go into bond for a two-year period and afterwards not be utilised unless the strength is absolutely unimpaired.

Finally, in spite of the oft-heard complaints launched against the long period necessary for the Electricity Commissioners' full "approval," the official tests and inspection should last for at least two years (serving the incidental purpose of discouraging frequent and incautious alterations in design and methods). These four steps, regarded separately or as a whole, may be considered to be revolutionary, or even retrograde, but in my judgment they are essential. Some attention, therefore, might now be diverted from the lower-bearing and usefully directed to the braking-magnet.

Measuring Resistance Values.

By G. W. Stubbings, B.Sc., A.M.I.E.E.

A method of calculation while carrying current

THE test described hereunder is one for determining the ohmic values of two resistances connected in series to a source of supply while the resistances are carrying current, and without interfering in any way with their permanent connections. The test is carried out by the use of a third resistance of known value and an ammeter. The ohmic value of this third resistance should be of the order of the sum of the unknown resistances. The procedure is as follows:—

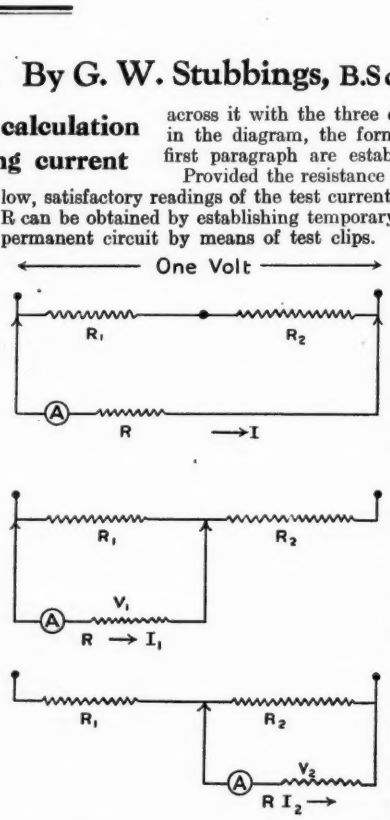
The known resistance R is first connected in series with the ammeter to the source of supply (fig. 1) and the current I in this resistance is noted. It is then connected with its ammeter in parallel with one of the unknown resistances R, as indicated in fig. 2, when the current in R becomes I. The resistance R with the ammeter is then changed over so as to shunt the second unknown resistance R_2, as shown in fig. 3; let the current in the known resistance with this connection be I_3.

The sum of the two currents obtained with the last two connections will be less than the current obtained when R was connected directly to the supply. Let this difference be called I_3; then the ohmic values of R, and R_2 are obtained from the formulas $R_1 = R \times I_3/I_2$ and $R_2 = R \times I_3/I$.

The proof of these equations is very simple. The combined resistance of the parallel combination in fig. 1 is $RR_1/(R+R_1)$ and the total resistance of the whole circuit connected to the supply mains is $\xi RR^1/(R+R_1)$ where the term ξRR_1 represents sum of the three products of pairs of resistance values.

Assuming for simplicity in calculation that the supply voltage is one volt, the drop V_1 on the parallel combination will be $RR_1/\xi RR_1$ volts. It is easily seen from the symmetrical form of this expression that when the connection of the resistance R is changed over so that it is put in parallel with the resistance R_2, as shown in fig. 3, the drop V_2 across the new parallel combination will be $RR_2/\xi RR_1$ volts. The difference between the sum of these two voltage drops and the supply voltage will be $R_1R_2/\xi RR_1$. Call this difference V_3; then evidently $R_1/R = V_3/V_2$ and $R_2/R = V_3/V_1$. As the measured currents in the known resistance R are proportional to the voltages across it with the three connections shown in the diagram, the formulæ given in the first paragraph are established.

Provided the resistance values are not too low, satisfactory readings of the test currents in the resistance R can be obtained by establishing temporary contact with the permanent circuit by means of test clips. While the test is being carried out, the value of the current in the unknown resistance which is not shunted by R will be temporarily increased, while the current in the shunted resistance will be reduced.



Top to bottom: Figs. 1, 2 and 3

Provided that all the resistance components concerned are approximately non-inductive, the test is suitable for alternating current as well as for direct current circuits.

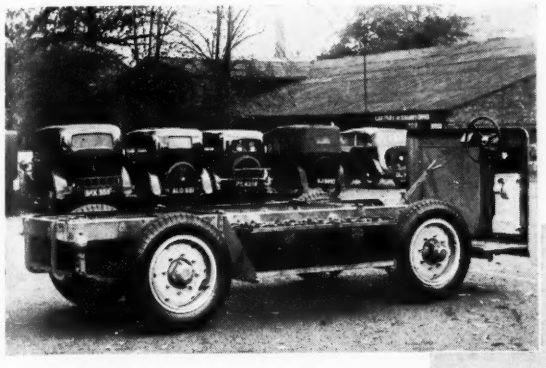
If the resistances of the unknown components are very high, the voltage drop can be measured directly by means of a voltmeter of known resistance, and the required ohmic values can then be calculated from the equations given in the second paragraph.

The Commercial Motor Show

New makes of battery-operated vehicles

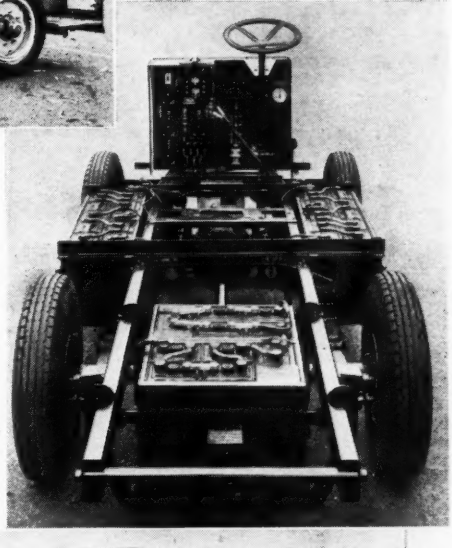
PROBABLY the most striking feature of the Commercial Motor Transport Exhibition now being held at Earls Court, London, is the exceptionally large number of trolley-buses shown. In fact, we counted no fewer than twenty-two of eight different makes on the fifteen stands of the various chassis and body builders. Not so obvious, but of equal interest to the electrical industry, is the entry of three well-known heavy duty vehicle manufacturers, Tilling-Stevens, Scammell Lorries and Sunbeam, to the battery driven electric vehicle market.

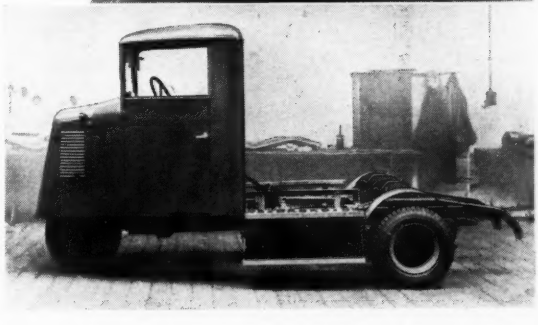
The appearance of the two first-mentioned makes of vehicle is of especial importance as indicative of the growing appreciation of the value of battery-driven vehicles for short distance haulage of loads in the 2-4-ton class. Tilling-Stevens are showing both a van and an electric "horse," each designed for a 2-3 ton load. With an 8-ft. wheelbase the van has an overall length of 14 ft. 4 in. and a width of 6 ft. 2 in. It has a channel section frame with a dropped front extension giving easy access and excellent visibility. The compound-wound motor is of the Tilling-Stevens enclosed ventilated traction type, capable of withstanding heavy overload. It is driven by a 100-V "Exide" battery with a 193-Ah capacity.



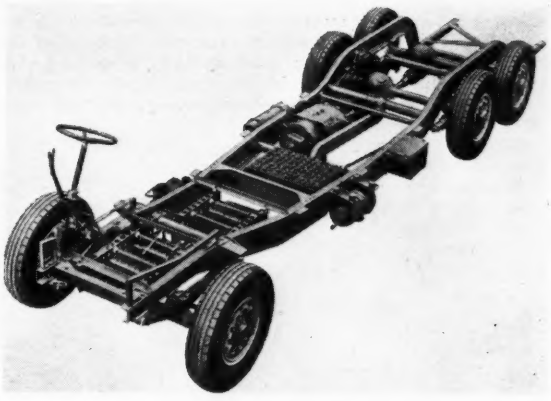
The pedal-operated controller incorporates a patent switch mechanism so arranged that the rate of acceleration of the vehicle is controlled independently and cannot exceed a predetermined rate even when the pedal is depressed quickly to its fullest extent. The direction lever, which is hand-operated, is interlocked with the controller and the charging plug can be inserted only when the lever is in the "off" position. An ampère-hour meter is provided to indicate to the driver the state of discharge of the battery and also to cut off the charging equipment automatically when the battery is fully charged.

With practically identical electrical equipment the same company's three-wheeled "electric horse" has a wheelbase of 8 ft. 8 in. and a turning circle of 18 ft. The overall length is 13 ft. 2 in. and the width 6 ft. 2 in. Final road tests are now being carried out on both vehicles. Each is expected to have a range of about thirty miles and the estimated maximum speed is 20 m.p.h. for the van and 17 m.p.h. for the tractor.





Another new electric horse, a 4-ton model shown by Scammell, is fitted with a 9.5-h.p., 85-V motor driven by an "Exide" battery. The motor is asbestos insulated and has forced air cooling. A foot-operated pedal gives four speeds. The unit, for which the electrical equipment was supplied by Partridge, Wilson & Co., has an 8-ft. 1-in. wheelbase, a 4-ft. 2-in. track and a 16-ft. turning circle. It is interchangeable with the standard petrol-driven horse, coupling with any of the company's trailers.



A Crossley three-axle trolley-bus chassis

For light delivery service the new Sunbeam 12/15-cwt. delivery van appears both in chassis form and also as a complete van built to the order of Selfridge & Co., Ltd. Its high capacity B.T.H. motor of the four-pole series-wound ventilated type is controlled by a foot-operated master controller. The complete control equipment assembly is mounted on the front dashboard. Both hands are left free for steering. The 196-Ah D.P. batteries are arranged in three groups in an easily accessible position on rigid trays outside the frame and between the frame members behind the rear axle.

Trolley-bus Developments

With regard to trolley-buses, the recent developments in the Karrier, Leyland, A.E.C.-E.E.C., Sunbeam and Ransomes vehicles have already been outlined in our issue of October 30th. We will therefore turn our attention to other makes.

Though introduced at the Scottish Motor Show last year and already in use at Belfast and Hartlepool, the Daimler trolley-buses have not been seen before in London. The six-wheeled model shown has been built for Belfast and has an all-metal 64-68-seat double-deck body. It has Metropolitan-Vickers electrical equipment incorporating a 90-h.p. motor, mounted amidships on rubber and compound wound for regenerative control and rheostatic braking. The control gear, of the electro-magnetic contactor type is arranged for cab mounting. Other features include a "straight-line" drive, battery manœuvring equipment, vacuum and air-pressure braking systems, with a mechanically operated handbrake for parking, and automatic brake adjusters. A similar vehicle in skeleton form is to be seen on the stand of Accles & Pollock.

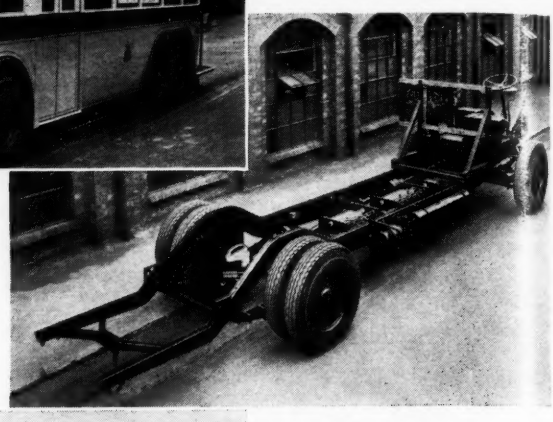
New battery-driven vehicles. From top to bottom: Tillings-Stevens 2/3-ton chassis, a Sunbeam 12/15-cwt. chassis, and a Tilling-Stevens 2/3-ton tractor

Designed on similar lines, a four-wheeled type shown in chassis form is provided with an 85-h.p. motor. Low operating and maintenance costs are a special claim for all Daimler equipment.

Another type of six-wheeled, 68-seat double-decker intended for use in Belfast appears on the Crossley stand. On a separate chassis visitors can inspect the simplicity of the layout. The motor is rubber mounted in the centre of the chassis to the off-side and the removal of four bolts and the uncoupling of the propeller shaft and wiring is all that is necessary to remove it from either

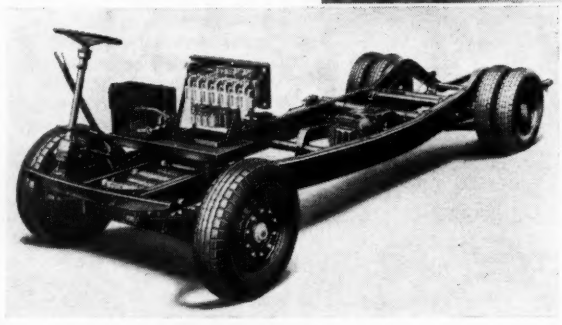
above or below. The transmission consists of a short tubular shaft from the motor to the middle axle with couplings of the needle roller bearing type at each end. Air-pressure brakes are fitted and the 90-h.p. Metropolitan-Vickers compound wound motor is designed for regenerative control, with rheostatic braking.

Controls of the electro-magnetic type are arranged for cab mounting and the connections are arranged to give regenerative control with differential braking and to provide for battery operation of the vehicle. The speed of the vehicle is regulated entirely by one pedal both for accelerating and retarding, except that on braking, when the speed has been reduced to three or four m.p.h. during the initial travel of the air brake pedal, rheostatic braking is applied followed by the air brake. The master controller is of the scissors type. A lightning arrestor and two radio interference suppressors are fitted and the 30-V lighting supply comes from a C.A.V.-Bosch single-shaft motor generator. On the complete vehicle a special type of concealed gantry is to be seen fitted with a lead-in through a rectangular hole in the roof and through the underside of the gantry into the main circuit-breakers mounted on the roof of the cab.



From top to bottom: A Guy trolley-bus for Newcastle-upon-Tyne, a Karrier "E4" four-wheeled chassis and a Daimler model

Although supplying models with motors mounted centrally, Guy Motors have a strong preference for placing them in front. The reason given is that when situated amidships the motor, which must be ventilated, is in the stream of mud or dust thrown up by the front wheels and if a low floor level is desired the size of the motor is restricted. If the motor is in front a circular form of greater efficiency can be used with a larger diameter armature and commutator; it is, too, in the most accessible position and the best for cooling. It is stated, furthermore, that while the central position permits a shorter propeller shaft to be used, the greater angle of the universal joints gives rise to heavier stresses on the joints.



Typical of the various Guy vehicles available, five different models can be seen. On the company's stand, in addition to a complete four-wheeled, 56-seat trolley-bus with an 80-h.p. motor for Llanelly, there is a six-wheeled chassis with a 100-h.p. motor for a 60-seat body for Newcastle-on-Tyne.

A similar model for Newcastle is also to be found on the stand of Charles H. Roe, while a 39-seat single-decker mounted on a six-wheeled chassis is shown by the Craven's Railway Carriage & Wagon Co. John C. Beadle, Ltd., have produced a 54-seat body for Wolverhampton.

The control gear used on Guy vehicles consists of a combined drum type controller and shunt regulator. The system of regenerative control is designed to withstand the most arduous conditions, while an arrangement providing for a slight increase in the pedal load after the rheostatic brake is fully applied and before the mechanical brake comes into action enables the driver to feel by foot-pressure when he has reached the limit of rheostatic brake application.

The demand for all-metal construction continues and the Brush Electrical Engineering Co. demonstrates the patent construction of its coachwork. The exhibition closes to-morrow (Saturday).

An Up-to-date Nurses' Home

TO accommodate the nursing staff and maids, numbering altogether about two hundred, a separate three-storey building has just been completed at the rear of the Royal Masonic Hospital, Ravenscourt Park, the electrical installation of which we described in our issue of January 12th, 1934. The new home is connected with the hospital by means of a subway which also serves as a duct for the main electricity supply cable and for ten conduits housing the cabling for the alarm, staff location, &c., systems. To control the supply to the home a separate switch room has been equipped with a Salford main circuit-breaker together with subsidiary iron-clad switch-fuses (G.E.C.).

For the circulation of the hot water for the radiator system throughout the building two Drysdale pumps driven by ½-h.p., 940-r.p.m. Crompton motors (with Igranic starters) are employed There is also a separate Pulsometer pump operated by a ¾-h.p., 1,425-r.p.m. Verity motor (Brookhirst starter) for draining purposes. A Cambridge recorder keeps an account of the water temperature, and an alarm is given should the level of the water in the tanks become too high or too low.

Supplementing the central heating and for decorative effect, "Magicoal" imitation coal fires of imposing design are provided in the main entrance hall and the "Silver Jubilee" room which is to be used for entertaining visitors. Electric panel fires (Bratt Colbran) are also installed in some of the sitting rooms.

Plain bowl ceiling fittings (Oswald Hollman) light the corridors and a variation of these with a bronze coloured reflector above appears in several of the sisters' flats and in the games room. In addition, the latter, a large panelled room on the ground floor, has two rectangular inset ceiling panels as well as eight sockets for supplementary fittings. In the nurses' bedrooms neat bronze fittings taking special short-necked 25-W lamps have been installed over the divan beds. Like many other attractive lighting units to be seen elsewhere in the building these fittings were specially made by Troughton & Young, Ltd.

All the nurses' and maids' rooms have headphones connected with a two-channel radio receiver (Radio Furniture & Fittings, Ltd.) in the basement. Loud speakers are fitted in the sitting rooms and a Venner time switch controls the set. A special call system (Julius Sax) is operated from a control panel situated at the porter's desk in the entrance hall and is arranged so that each room can be connected to any of six circuits, thus permitting six different groups of the staff to be called at different times. The home is also interconnected with the hospital fire alarm and staff location systems. Small tea-making and laundry rooms have been provided for the use of the nurses on each floor.

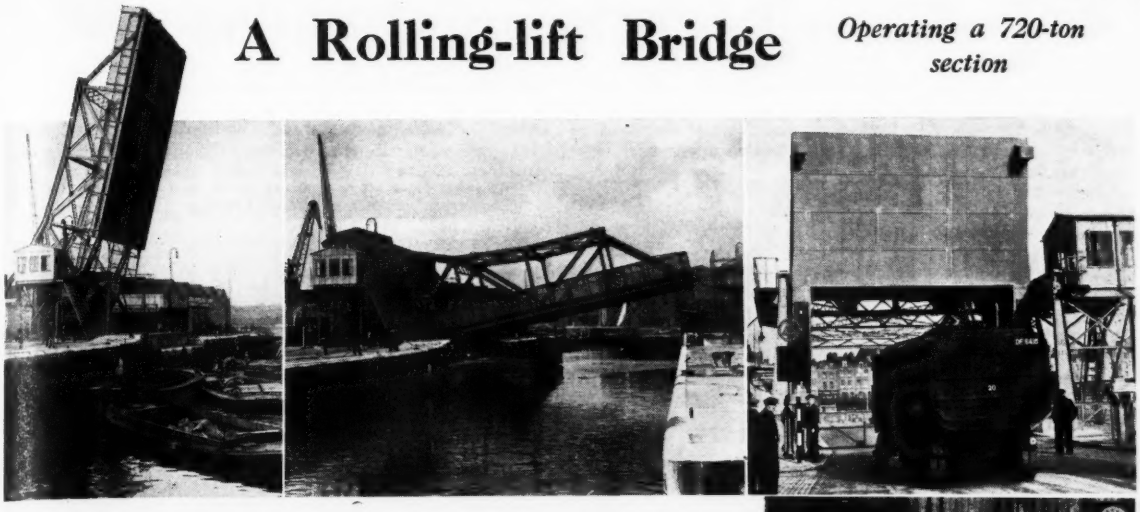
Gent electric clocks are installed throughout the building, and there are skirting sockets in appropriate places for the use of vacuum cleaners and floor polishers. A Hammond Bros. and Champness 12-passenger electric lift serves all floors. The electrical installation for the whole building was carried out by Tyler & Freeman to the design and under the supervision of J. Stinton Jones & Partners, consulting engineers.

The Batti-Wallahs' Society

The first luncheon of the season of the Batti-Wallahs' Society will be held on November 23rd at the Hotel Victoria, W.C.2, when Mr. W. J. Jones will give an address on "Lighting Developments in U.S.A." The annual dinner and dance of the Society will be held at Grosvenor House, Park Lane, W., on March 18th.

A Rolling-lift Bridge

Operating a 720-ton section



AS part of a comprehensive scheme for improving the approaches to the London docks, the London County Council is rebuilding nine road bridges in this area. The fifth to be completed carries Glamis Road, Stepney, over the entrance lock to the Shadwell New Basin and it replaces a single-track hydraulically-operated bridge which was only 15 ft. 6 in. wide. The new bridge is 40 ft. wide, including a 7 ft. 6 in. footpath on either side of the 25-ft. carriage way; its length is 70 ft. and the weight of the moving section is 720 tons, rising 100 ft. above ground level when lifted.

It has been built at a cost of about £42,000 (including the widening of the immediate approaches) by Sir William Arrol & Co., Ltd., and is electrically operated on the roller-lift principle by English Electric d.c. motors, which are controlled by Igranic contactor gear housed in an elevated control cabin alongside.

Electricity is obtained from the Stepney Borough Council's d.c. mains, *via* a service chamber and two Henley street pillars. The cables rise vertically into the control cabin, terminating in Vincent isolator and Sanders fuse boxes, going thence to an Igranic 480-240 V control board of the flat-back slate panel type. One panel carries the main circuit-breaker, indicating instruments and porcelain "Artic" fuse holders; the other three panels accommodate main and auxiliary contactor gear, while the necessary "Rheostatic" resistances are mounted overhead under the cabin roof.

Mechanical and illuminated electrical indicators show the position of the bridge while being raised, additional to observation through the cabin window from the master controller position. The Callender cables (approximately 50 cores) are taken up to the moving portion of the bridge in metallic flexible tubes of large diameter.

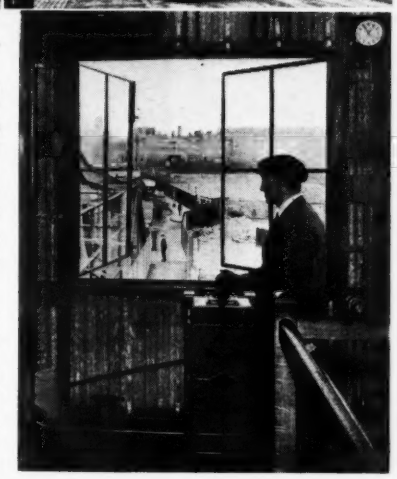
The driving motors are housed in front of the ballast box (which is filled with concrete and cast iron) in the heel of the bridge. At the centre of the motor shaft is the differential gear case, by David Brown & Sons (Hudd.),

Automatic contactor control panels

Ltd., rated at 150 h.p. for speed reduction from 700 to 179.5 r.p.m. The two Igranic electro-magnetic brake drums are placed on either side of the gear case and are shunt wound for 83.5 V (coil) and 240 V (line). The two d.c. English Electric motors are at the extremities of the shaft on each side, each of 75 h.p. at 700 r.p.m. (126 A at 480 V, half-hour rating). Normally one motor only is intended to be used for operating the bridge, the two machines being utilised on alternate days; but both can be employed simultaneously to raise the bridge against unusual wind resistance. Ordinarily both electro-magnetic brakes will function when either or both motors are working, the second armature rotating idly on the shaft when one motor only is in service.

Moving the master controller handle to the first opening notch initiates a sequence of contactor operations

Master controller in operator's cabin



which sets the road warning gongs (Gent) in operation and illuminates the traffic signs (G.E.C.) which display first the words "Gates closing" followed after a short interval by "Stop here." In the meantime the road gates are freed by their mechanical keys and the gate leaves are closed by hand, the two left-hand leaves first to enable vehicles on the bridge to drive clear before the two right-hand leaves swing across, when the visual indicator in the control cabin shows "Gates closed."

Movement of the controller to the second opening notch causes a 1.5 h.p. English Electric 240-V motor in the nose of the bridge automatically to withdraw the locking bolt and then stop itself, the motor accelerating relay being set for two seconds. Movement of the controller to the third notch starts one or both main motors (according to the positions of the isolator switches) at creeping speed. The fourth notch will bring in the accelerating relay which is set for ten seconds and so the motor is brought up to full speed. In the nearly-open position electric and mechanical bells warn the operator that the bridge is slowing down to creeping speed prior to stopping itself in the fully raised position.

The closing sequence is somewhat similar, *i.e.*, with the controller on the first closing notch, the bridge will be lowered at creeping speed. The second closing notch automatically initiates the accelerating operation, bells again sounding just before deceleration commences. The creeping speed is further retarded by buffers and the bridge will stall on the abutment for a few seconds before the third notch of the controller starts the small motor for inserting the locking bolt. The fourth closing notch of the controller energises a

Up-to-date Theatre Lighting

THE complete reconstruction of the interior of the Prince of Wales Theatre, which has just reopened, has been taken as an opportunity to introduce a new system of illumination throughout. Concealed lighting is employed almost exclusively and a particularly effective application is found in the "halo" running round the proscenium right down to the floors. The gold-sprayed ceiling is illuminated by a similar cove running across the auditorium, while seven semi-circular coves shed a soft amber light on to the panelled dado. Further decorative effects come from illuminated diamond-paned windows over the boxes and the main balcony walls. To avoid distracting attention from the stage even the emergency lighting has been hidden from view.

The exterior, a stage lighting effect and a lounge at the Prince of Wales Theatre. [*Elec. Rev. photos.*

Concealed cornice lighting gives a warm glow of comfort to the bars and lounges. The largest of these, which can be used as a dance hall, has a novel feature in the form of the glass counter illuminated by three-colour neon tubing. "Port hole" lighting is used successfully in a smaller bar adjoining.

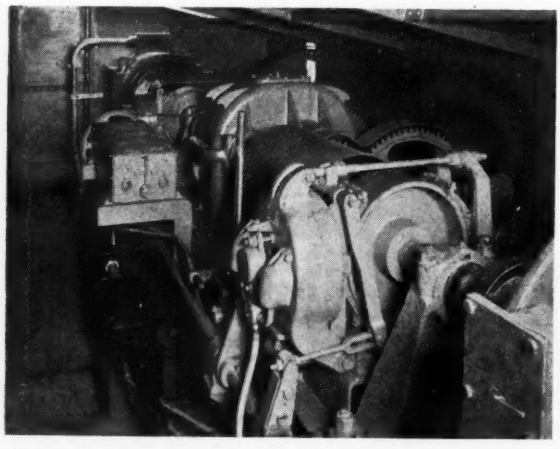
Footlights have been dispensed with. Instead, lights have been recessed in the edge of the circle. Along the front of the stage and round the orchestra pit glass panels illuminated from below are brought into service for novel dancing effects. "Stelmar" equipment is used for the usual spotlighting from projector room, which also contains a Kalee cinematograph projector. Two E.C.C. 300-A mercury bulb rectifiers, each with their own contactor panels, supply the necessary d.c.

Four microphones on the edge of the stage are connected with a R.C.A. amplifier system, which balances up the volume of sound from the various performers and the orchestra. As well as revolving, the centre of the stage can be elevated if desired. There is also a platform which can be raised to bring the leader of the orchestra into view.

The stage lighting has been carried out by the Strand Electric & Engineering Co., Ltd., and the other electrical work, including the lighting of the auditorium, etc., by the Berkeley Electrical Engineering Co., Ltd., to the design of Mr. Basil Davis, consulting electrical engineer. The neon tubing for the bar counter as well as the 5,000 ft. employed on the exterior of the building, was supplied by Ionlite, Ltd. F. H. Pride manufactured the bar and cloakroom signs. A vacuum cleaning installation was provided by the British Vacuum Cleaner and Engineering Co., Ltd.

A Rolling-lift Bridge *(Concluded from previous page)*

shunt wound solenoid (by Edward Holmes & Co., Altrincham) on each of the four road gate posts. This permits of the locks being freed, so that the gate leaves can be swung open, after which the restrictive traffic signs are extinguished.



Main motors and electro-magnetic brakes

Provision has also been made for operation of the bridge by hand and for releasing the brakes in cases of emergency. Two hand operating speeds are provided by means of high or low speed gearing as required. When the hand gearing is engaged an interlock trips all power circuits to the control board.

The photographs illustrating this article were taken by our own photographer.

Electric Cooking in America

In view of the strenuous efforts made in this country to obtain cooking loads, and the profitable results which have accrued therefrom, the following statement by Mr. H. Russell, president of the Rochester (U.S.A.) Gas & Electric Cpn., in *Electric Light and Power*, is strange. He says:

"The only excuse for promoting electric cookery is to prevent the introduction of other fuel into the home, which might be used not only for cooking, but also for heating water. The complete electric service can only be justified if the water heating load is obtained."

However, another American company finds it profitable, and at a rate of scarcely over 1.5c. can afford to spend $40 to sell each cooker. American cooker sales in 1936 showed an increase of 44 per cent. over 1935; this year a further increase of 35 per cent. is expected, bringing the total number to 420,000. Progress has been made by the Utah Power & Light Co., a 78 per cent. increase being secured in 1936, due to increased sales in working-class districts on long-period terms and low running charges. It is generally agreed that to sell cookers to the "wage earner" the rate must be 25c. or less, instalments must be over two to four years, and special wiring schemes must be adopted. These we have in this country, where it would appear that the value of the cooking load has been realised sooner than in the United States. No reference appears in the article to simple hire terms, which we are accustomed to.

Electricity Supply Progress

The seventeenth annual report of the Electricity Commissioners

The electricity output during 1936-37 rose by 13.3 per cent., domestic supplies increasing by 17.4 per cent.

DURING the year ended March 31st last continual improvement in trade was reflected in an increased production of electricity by authorised undertakings—an increase of 13.3 per cent. in kWh generated over the previous year's figure, bringing the total output to 20,868 million kWh. The aggregate increase during the past four years has been 66.8 per cent. of the figure for 1932-33.

The results of a further survey of connected premises are included in the seventeenth annual report of the Electricity Commissioners (Stationery Office, 2s. 6d.). Total connections of 7.65 million represent an increase of 15.1 per cent. over the 1934 survey returns; 6.48 million are domestic premises, being 17.4 per cent. more. This leaves 5.23 million still unconnected to supply systems, of which 4.45 million are domestic.

Domestic premises representing 85 per cent. of the number of consumers accounted for 23 per cent. of the total sales of electricity and 37 per cent. of the corresponding revenue. About 500 kWh was sold per consumer at an average price of 1.75d. Power consumers, forming 2 per cent. of the total number, took 60 per cent. of the energy sold and provided 34 per cent. of the revenue from sales, which averaged 0.51d. per kWh for high-voltage and 0.79d. for low-voltage supplies. Commercial buildings making up the remainder consumed about 17 per cent. of the electricity sold, contributing 29 per cent. of the revenue, which averaged 2.01d. per kWh sold for 2,300 kWh each. Uneven progress in different areas of supply is noted. There were 620 undertakings holding powers: *viz.*, the C.E.B., three J.E.A.'s, five joint boards, 369 local authorities, and 242 companies.

Some particulars are given of fuel consumed in 442 generating stations in 1936, including 38 traction and non-statutory undertakings, which were given previously in the "Fuel Returns." An average of 1,516 kWh per ton of fuel was generated in the stations of authorised undertakings, compared with 1,200 in 1930. There were 137 selected stations in existence (nine new) out of the 144 projected, and these generated 87 per cent. of the total output of 21,650 million kWh produced by the 442 stations in the calendar year.

Of the 16,804 million kWh sold to consumers (15.4 per cent. increase) nearly two-thirds was provided by public authorities. On the basis of a population of 45.8 million in 1936, the consumption was 366 kWh per head.

New Plant

Generating plant sanctioned amounted to 1,078,055 kW (261,250 kW in N.W. England), as against 699,512 kW in the preceding year and an annual average of 478,000 kW during the past sixteen years. Included in the plant sanctioned in 1936-37 was 120,000 for the Dartford station of the Kent Power Co. and 155 kW for the Campbelltown and Mid-Argyll E.S. Co. The remainder, to be installed in existing stations, includes seven 50,000-kW, thirteen 30,000-kW, one 25,000-kW and two 20,000-kW sets. An application was received from the Port Talbot Development Co. for the establishment of a thermal-electric generating station in connection with an industrial development scheme.

At the end of the period under review the capacity of generating plant installed by authorised undertakings amounted to about 8.4 million kW. Of the 8.73 million kW that has been sanctioned during the past seventeen years, 58 per cent. was for public authorities, 34 per cent. for companies and 8 per cent. for traction and non-statutory stations.

Among the 35 consents issued for main transmission lines were two for 66 kV underground cables for the London Power Co. and the Metropolitan E.S. Co. Applications for nine special orders were proceeded with. Two related to the establishment of new undertakings, three to extensions of area, two to transfers and two to miscellaneous purposes.

Loans Sanctioned

The number of applications from public authorities for sanction to borrow (1,115) was the largest recorded since the establishment of the Electricity Commission in 1920. Sanctions were issued for £24.15 million, 40 per cent. more than in the previous year; £9.6 million was for mains and services and £8.8 million for plant. The principal sanctions granted were £1.82 million to Liverpool and £1.73 to Bristol, with an aggregate of £500,000 for the purchase of undertakings in five cases. Apparatus and wiring for hire and hire-purchase accounted for £1,867,000, and changes of system or voltage on consumers' premises for £260,000. More than 200 consents were given to local authorities to apply surplus revenue exceeding £896,000 in payment of expenses chargeable to capital, chiefly for distribution.

At the end of March the Central Electricity Board was giving direct bulk supplies to 208 authorised undertakings and one transport concern; these included 103 undertakings and one transport undertaking owning selected stations. There were also 485 bulk supplies taken, inclusive of indirect supplies in bulk from the grid. The number of undertakings giving bulk supplies was 162 and the number receiving them 390. About 0.6 per cent. of the gross public supply was furnished from traction and non-statutory sources. Consents were given to the alteration in type or voltage of supply to forty-two undertakings.

Meter Testing and Research

In a section discussing the Electricity Supply (Meters) Act, 1936, it is stated that 430 undertakings possessed testing stations, in which the meters of ninety other undertakings were tested; of 100 undertakings which had no testing stations, many depended upon tests by manufacturers. About 1,130,000 new meters and 950,000 old meters were tested by authorised undertakings in 1935, when about 9,488,000 meters were installed.

The Commissioners received and circulated reports from the Electrical Research Association relating to tests on concrete poles, deterioration of reinforced concrete by electrolysis and safety of consumers in rural areas. They have also arranged with the Association to undertake tests on machine-made concrete piles and the manner of holding the butts, measurements of earthing resistance over overhead-line towers, coke as an earth electrode and the voltage gradient around small electrodes.

The Minister of Transport gave his consent in 4,068 cases to the erection of overhead lines. He also made an Order requiring the removal of a line (which had been constructed without his consent); this was the first Order of its kind since the Act of 1919.

Complaints as to charges for electricity in many cases showed a lack of understanding of the factors involved in the framing of two-part tariffs; in other cases the complaints were directed solely against flat rates. No awards were made.

The administrative expenses of the Commission apportioned among authorised undertakings were £63,000, which, on the basis of kWh sold, represented 1.05d. per 1,000 kWh. The amount of £600,000 for frequency standardisation similarly apportioned worked out at 17s. 4d. per £1,000 of revenue from the sale of electricity other than bulk supplies.

Rural Schemes

Nearly half of the 127 pages of the Report are made up of thirteen appendices. In the first of them is given the statistical information regarding rural electrification schemes that in previous years has appeared in the body of the Report. The deficit on the Bedfordshire Demonstration area has been considerably reduced, kWh sold increasing by 31 per cent., but more than two-thirds of the advance was due to brickworks supplies. About 78 per cent. of occupied dwellings were connected with a consumption averaging 848 kWh.

The Dumfriesshire scheme depends mainly on domestic load and within four years nearly half of the total premises are receiving supplies, taking 780 kWh per consumer; owing to an increase in capital charges of nearly 25 per cent., a small surplus has become a small deficit. Particulars are also given of the Kirkcudbrightshire undertaking, the nucleus of which was the d.c. networks of five non-statutory undertakings that were acquired by the County Council and changed over to a.c. working; results to date are regarded as very satisfactory, a small surplus being obtained from 1936-37.

In the Norwich demonstration area, where two-thirds of the occupied dwellings have been connected in a district remote from an urban centre, about 443 kWh is taken per domestic consumer—a lower figure than in the other schemes.

Other appendices provide information regarding undertakings' schemes for development, extensions of generating stations, main transmission and non-statutory lines, Special and Fringe Orders, new loans allocated to various purposes for each undertaking, alterations in voltages and change-overs from d.c. to a.c., approved meters, compensation for loss of office, new special Acts, and the Commission's accounts.

Vibration in Overhead Lines

A method of prevention

THE problem of avoiding damage to overhead lines by vibration and consequent mechanical fatigue of the conductors resolves itself into the question of reducing vibration to the minimum and preventing concentration of stress from such vibrations as do occur. If the supporting clamps are bell-mouthed at the ends, to avoid pinching and notch-effect in the conductor metal, and if they are freely pivoted and designed for minimum moment of inertia about the axis of pivoting, maximum opportunity is given to the formation of unconstrained nodes at the points of suspension. This minimises the bending stress in the conductor and avoids the alternating stress and rapid fatigue set up by reflection of vibrations from heavy, rigid clamps.

A clamp designed on this principle and used on a number of Swiss, German, and Italian transmission lines is shown in fig. 1. The main body of the clamp is of high-tensile aluminium alloy, and all the weight is kept as close as possible to the axis of pivoting. According to data given by M. Preiswerk, of the S.A. pour l'Industrie de l'Aluminium, Neuhausen, in his recent paper before the International Conference on High-voltage Networks, fatigue tests have shown that a stranded conductor carried by a clamp of this type has from ten to thirty times the life of one with heavy clamps of older form.

Averting Fatigue Failures

Whatever the success attained by the use of low-inertia, free-pivoted clamps in reducing the detrimental effects of swaying and sporadic vibrations in overhead lines, there remains the problem of suppressing or preventing the formation of recurrent vibrations, the continuance of which must inevitably lead to failure by fatigue. The theory of the establishment of resonant vibrations by a sustained wind is that rhythmic detachment of air eddies from the conductors occurs at places and moments suited to the formation of migratory waves. The partial reflection of these waves at the clamps builds up standing waves, and once any considerable mechanical movement is established it facilitates the detachment of eddies and may be rapidly self-amplifying.

Spring-dampers, with a shell or spindle clamped to the line and carrying a mass, 90 per cent. of the weight of which is spring-borne, are effective in absorbing the energy of the small migratory waves that may otherwise build up resonance. The suppressive effect of such dampers is increased by the fact that they have no well-defined natural frequency. Their action is, however, essentially that of restricting the amplitude, without

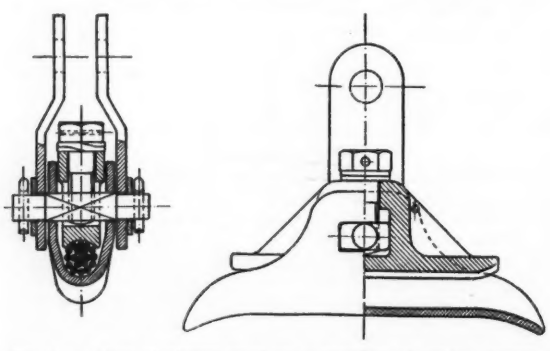


Fig. 1.—A type of clamp used on a number of Swiss, German, and Italian transmission lines

preventing the setting-up of vibrations, and there are limits to the efficacy of point-damping in the protection of continuous flexible conductors.

The ideal solution to the problem is the use of a conductor which is inherently incapable of vibration. This necessitates a compound construction with the conductor in at least two parts, neither of which can participate in natural vibrations of the other. The two parts must be mechanically separate to the extent that they cannot vibrate as a mechanical whole, but they must be so arranged that any tendency of one to vibrate is immediately suppressed by the different vibration characteristics of the other. These desiderata are fulfilled completely and very simply by a steel-cored aluminium conductor, the steel core of which is of slightly smaller diameter than the bore of the hollow stranded-aluminium component.

Fig. 2 shows typical cross-sections of two anti-vibration conductors of this construction, one (left) with a steel core of one-sixth, the other with a steel core of one-eighth the section of the aluminium outer. Particulars of a number of lines built on this system are given in M. Preiswerk's paper, and from later information received from the Anglo-Swiss Aluminium Co., Ltd., relating to the patent of the Aluminium Industrie A.G., Switzerland, there is now 155 miles of anti-vibration conductors in service in Germany, and another 466 miles is under construction or shortly to be put in hand. Representative constructions on the latest sections of 100-kV transmission lines to be thus equipped are:—

0.186 sq. in.*:	Steel	7 × 0.077 in. dia.
	Aluminium	12 × 0.094 in. dia.
		21 × 0.079 in. dia.
0.232 sq. in.*:	Steel	7 × 0.085 in. dia.
	Aluminium	12 × 0.104 in. dia.
		21 × 0.087 in. dia.

The span is about 820 ft. in each case. These data relate to the 1 : 6 steel-aluminium combination, which requires the use

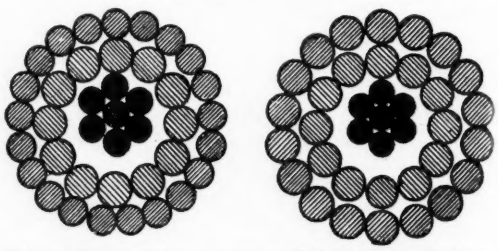


Fig. 2.—Cross-sections of two anti-vibration conductors

of larger wires for the inner than for the outer layer of aluminium in all sizes up to 0.31 sq. in.* With a 1 : 8 ratio of steel to aluminium section, the aluminium wires are of the same size in both layers, and range from 30 × 0.067 in. dia. in a 0.109 sq. in conductor, to 30 × 0.156 in. in a 0.566 sq. in. line. For very long spans or where heavy ice loading is expected, Aldrey wires are used instead of aluminium.

The two conductors are strained for different natural frequencies, and special clamps have been developed to facilitate this operation, the clamps themselves carrying no current. The clearance between the steel core and the inner layer of aluminium wires is of the order of 0.06 to 0.12 in., the aluminium resting on the steel at the centre of spans, and the steel on the aluminium at the clamps.

Satisfactory Solution

The heavy distributed damping resulting from the variable contact, and interference between the motions of the conductors, in conjunction with their different natural frequencies, makes it impossible to establish any coincident or sustained vibrations, and constitutes what appears to be a satisfactory solution to the problem of avoiding fatigue fractures. Corresponding to the prevention of vibration, the relative motion between the core and sheath in service should be small, and confirmation of this is to be found in the fact that neither wear of aluminium nor abrasion of galvanising on the steel has been detected after 12-18 months' severe service.

The overall diameter of the anti-vibration conductors is only about 4 per cent. greater than that of standard steel-cored aluminium conductors, and ordinary cable drums can be used for their storage and transport. The higher cost of the special construction is offset by the elimination of separate damping devices and by the better utilisation of the strengh of the steel core, resulting from its being strained independently. This permits a saving on the cost of towers by using longer spans or lower towers for given stressing of the aluminium. Experience during the past three years shows that the steel core is unaffected by severe flash-over caused by lightning, and a tubular bond—or a pair of them with a new length of aluminium sheath wires between—enables damaged sheathing to be repaired quickly.

* Nominal, corresponding closely to the total cross-section of the aluminium conductors in each case.

I.E.E. Liverpool Dance

The second annual dance organised by the Mersey and North Wales (Liverpool) Centre of the Institution of Electrical Engineers took the form of a dinner-dance and was held on October 29th at Reeces' Red-White Ballroom, Liverpool. The guests were received by the chairman of the Centre, Mr. G. K. Paton, and Mrs. Paton, and the attendance of nearly 200 included representatives of other Centres. It is hoped that a substantial surplus will be available as a donation to the Benevolent Fund.

Meetings and Discussions

The construction and operation of cooling towers for power stations was discussed by Mr. T. J. Gueritte in a paper read before the London Technical Group of the E.P.E.A. last week, when the merits of timber and concrete towers were compared. The Institute of Marine Engineers heard a paper describing electro-magnetic couplings for ship propulsion, by Messrs. G. L. E. Metz and N. Ericson on Tuesday last. Mr. Tyack's paper on traffic signals was discussed at the I.E.E. meeting last week; the requirements of traffic received considerable attention from speakers.

Cooling Towers

MODERN tendencies in condenser water cooling tower design were discussed by Mr. T. J. Gueritte at a meeting of the London Technical Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION at Westminster last week. He said that timber towers had given place gradually to reinforced concrete towers and units of a specified normal capacity of 3,500,000 gal. and emergency capacity of 4,375,000, were working in this country, their diameters exceeding 160 ft. at the base, and their height exceeding 260 ft.

Structural steel had serious disadvantages in respect of cost, upkeep and durability. Research had demonstrated that streamlining, in accordance with the latest developments in aerodynamics, of the water distribution troughs resulted in a considerable improvement of efficiency over that of the rectangular type, and there was reason to believe that considerable further steps would be achieved soon towards greater circulations, when probably a normal circulation of 6,000,000 gal. with emergency circulation of 7,500,000 per hour would be dealt with.

The average temperature of river water in July might be as low as 18 deg. C., and plant which his firm had designed for Imperial Chemical Industries, Ltd., cooled the water to a temperature lower than that of river water for the months of May and August, 1935, practically equal for July, and the average over the four months (May to August inclusive) was only 0.4 deg. C. above that of the river, although the average range of cooling was nearly 12.5 deg. C. For the same months of 1936, while the average temperature of the river was 15.6 deg. C., that of the re-cooled water was 18.3 deg. C., the slightly greater difference of nearly 2.7 deg. C. being accounted for by the high range of cooling, nearly 16 deg. C., approximately twice as great as in the usual power station practice.

It was possible, during the summer, to re-cool water to practically the same temperature as river water. It would be more difficult in winter, with a natural draught tower, but it was quite unnecessary to attempt that in power stations. It was possible by the use of induced draught with a propeller fitted at the neck of a tower, to draw the air uniformly along the whole periphery of the base of the tower. Propellers for such towers had generally a diameter varying from 15 to 20 ft., and in some cases 30 ft.

Thus the riverside location of power stations lost one of its important advantages. The enhanced prime cost of a riverside station due to foundations in alluvial strata, such as were generally encountered near large rivers, to the construction of intakes in rivers subject to floods or to important tidal variations, more than balanced the advantages of using water-borne fuel in many cases. There were comparatively few cases in which it was decidedly desirable to adopt a riverside situation; an inland site nearer the coalfields and nearer to the district in which the greatest part of the energy produced would be consumed, often proved more advantageous.

Much of the discussion turned upon costs and the author, in reply, said that one of the mistakes of the early days was that of too much standardisation, without considering the merits of each case. The costs of reinforced concrete and timber towers were about the same, but the timber towers were the more bulky and occupied more space; their cost was exactly half that of circular steel towers in this country, and quite recently a reinforced concrete design was accepted for a tower of 600,000 gallons per hour capacity because it was cheaper than a timber tower. Reinforced concrete internal troughs for the towers were more expensive than wooden ones in first cost, but lasted much longer.

For an expenditure of perhaps 15 per cent. extra on the first cost of a tower, the efficiency could be improved to an extent which would reduce the steam expenditure, and therefore the fuel costs, by 3 per cent., and could be recouped in three years by the saving effected in steam consumption. The cost of cooling towers per kW of output at a power station might be reckoned at about 25s. for very small units, and down to about 15s. in the case of the larger towers.

The make-up water figure given by the B.E.A.M.A. was 1 per cent. for 12 deg. range of cooling and that was quite safe to estimate on.

Electro-magnetic Slip Couplings

FOR ship propulsion, high-speed geared Diesel engines are of lighter weight and need less head room than the ungeared type. But their use involves placing some form of flexible coupling between the engine and gear to avoid transmitting the torque impulses. For this purpose an electro-magnetic slip coupling has been developed by the Allmänna Svenska Elektriska A.B. (A.S.E.A.) with the advice of the Atlas Diesel Co., Ltd. It is described, together with a number of installations at present in service, in a paper by Messrs. G. L. E. Metz and Nils Ericson that was read in London on November 9th at the INSTITUTE OF MARINE ENGINEERS.

Uncoupling can be effected merely by operating a switch, so that an engine can be shut down for overhaul, or for cruising at reduced speed, the remaining engines geared to the same propeller continuing in operation. Other advantages claimed are absence of wear; safeguarding of the remainder of the installation due to limited ability of the couplings to carry overload, the maximum torque that can be transmitted being about twice the normal; and absence of necessity for perfect alignment between the two halves of the coupling.

In general principle, the coupling follows the induction motor except that the "stator" rotates as well as the rotor, normally at very nearly the same speed. The primary, on the gear shaft, carries electro-magnets excited through slip rings, while the secondary on the crankshaft has a short-circuited squirrel-cage winding. The excitation is by d.c. at any available voltage. The normal slip is about 1.5 per cent., and the characteristics of the coupling are such that any value of torque can be transmitted, irrespective of the r.p.m. The efficiency of the coupling itself is 98 to 99 per cent., and a further 1 to 2 per cent. is lost in the form of excitation energy derived from the auxiliary dynamo. The torsional oscillations of the engine itself are practically unaffected by the coupling, but only slight oscillations are transmitted through the coupling to the gearing and screw shaft.

There is no appreciable variation in slip during manœuvring, and the method of engine control is not affected by the use of the coupling. Under abnormal conditions it is possible for the two halves of the coupling to get "out of step" and operate at a greater relative slip. The slip is shown by a stroboscope and since the slip depends on the torque, the torque and power can be deduced from a knowledge of the slip and excitation current. As an alternative to the normal method, rapid manœuvring can be effected by keeping the engine running and using the coupling switch. A single screw two-engine installation of 2,100 b.h.p., engine r.p.m. 300, propeller r.p.m. 130, and a 4,400-b.h.p. installation consisting of four engines running at 300 r.p.m. and geared to a single screw at 90 r.p.m., are described in the paper.

Signalling Street Traffic

MEMBERS who took part in the discussion on Mr. F. G. Tyack's paper (which was referred to last week) on vehicle-actuated street traffic signals at the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 4th seemed to be more concerned about traffic requirements than technical aspects. Several of them stressed the need for standardisation and the desirability of unified maintenance.

Mr. A. E. M. Taylor (Ministry of Transport) said he could not agree that centrally suspended signals were much more costly than pillar types. Some two-light signals were in use in the provinces. The basic requirements as stated by the author were not by any means all he (Mr. Taylor) would consider necessary. They were still seeking far better methods of judging the performance of such signals.

Mr. T. P. Priest suggested the setting up of a small committee for standardisation purposes. There was still some controversy about whether the "first come first served" system was justified. To ensure real efficiency nearby roads should be signalled in addition to, and interlinked with, major intersections. A four-phase system was already in use at Blackfriars.

Mr. B. O. Anson said that they would have to go much further with standardisation and that fact should be realised before too much equipment was installed. A single authority should be made responsible for all maintenance, say the

Ministry of Transport, which in collaboration could learn how the Post Office did similar work. The administrator was continually asking the engineer if he could do more and it required a very good engineer to refuse.

Mr. W. F. Adams submitted a document which compared systems in detail. He instanced routes that had been speeded up, while others had been retarded. In one case five police-regulated points had been replaced by sixteen signal-controlled points. In spite of increased cross-traffic delay periods had been reduced. Mr. S. A. Bryan remarked that the whole of the switching operations were done by relays, but the paper contained little about the relays themselves. He accordingly proceeded to outline their constructional principles and special features.

Mr. D. A. Bellamy sounded a note of warning. Too much should not be expected of traffic signals because if the traffic engineer could not produce a reasonable time-spacing diagram all the efforts of the electrical engineer would be useless. Mr. S. G. Purkie pointed out that the method of timing would depend on the system of progression. The "first come first served" principle was a very valuable one from the point of view of the local authority, which had to deal with road users' complaints. Unification of the control of maintenance was desirable; improvements could not be introduced when adjoining boroughs refused to co-operate at the boundaries. The part of the equipment that caused most trouble was that which supplied energy to the signals.

Mr. R. B. Matthews said that local authorities' ideas about timing varied too much, especially regarding the length of the amber light period, while it was not satisfactory for drivers to have to turn off the main route against the red light. He suggested reasonable duplication of essential components to facilitate automatic replacements in emergency. Mr. A. Trigg thought that some of the terms used by the author were not suitable, while Mr. A. B. Hunsfield considered that definitions had not been arranged logically. Mr. E. S. Ritter suggested that the pedestrian's aspect deserved more consideration that it seemed to have been given.

Mr. R. W. Palmer supported the plea for standardisation and regularisation of traffic signal "language." The author's definitions were merely means of circumventing difficulties and did not represent any general scheme. Mr. H. D. Riddle discussed performance curves and Mr. C. F. Wray said that time plans never seemed to be effective in practice; they tended to divide traffic into blocks with spaces between which represented wastage.

Mr. Tyack, in reply, pointed out that one great difficulty was to find two systems working under absolutely identical conditions so as to enable accurate comparison to be made. It was desirable to interlink adjoining sections and signal whole areas, rather than odd stretches of road or single intersections. The Ministry of Transport had gone a long way towards inducing uniformity by paying a fair proportion of signal costs when the equipment installed conformed to the Ministry's requirements. The equipment at Marylebone was to some extent in duplicate to permit of automatic change-over, in conjunction with fault-alarm circuits, as well as alternate use by time-switch control.

Transmission of Power

AT a meeting in London last week, Mr. T. C. Bowen, chairman, presiding, it was explained how the POWER TRANSMISSION ASSOCIATION proposes to serve industrial users of power.

Mr. A. A. Pearson, who piloted the new organisation through its first year of existence, stated that its primary object was to elucidate facts, some of which, they were well aware, might not be entirely to the liking of all who were connected with the industry. They felt very strongly the need for a serious study to be made of the technical aspects of power transmission.

After much discussion it was decided that their policy should be unbiased, which sounded rather too good to be true, but it was really the common-sense policy. They must look facts in the face. If the recent developments which favoured the use of small electric motors for driving each separate unit were the most efficient and economical, it would hit many firms hard, but it was better for power users that reliable data be obtained in order that they might know more definitely what the best system was.

Mr. S. Osbourn Shave, director, said that their policy was not pious idealism, for to give customers honest advice and good service produced repeat orders and cultivated valuable goodwill. To the manufacturers and distributors of prime movers, including electric motors of all sizes, the Association was a neutral body on the assumption that it did not pay them in the long run to misapply their products.

Facts and information were to be collected and collated for the use of members' sales and technical representatives and a research engineer was at present engaged in obtaining figures from British industry so that the varied experience of members might be pooled. There were already over 100 members in Great Britain and the Empire. The body was not a price-controlling association and membership was open to all manufacturers and distributors of mechanical power transmission equipment and supplies who were willing to adopt impartial policy and principles.

Rural Charges

THE question: "Should Rural Tariffs be the same as those in the Town?" provided some interesting criticisms of modern conditions last Friday at a meeting of the London Branch of the Electrical Association for Women held at its headquarters in Regent Street, London. Miss L. F. Ramsey, of the National Federation of Women's Institutes, declared that although uniform tariffs might not pay at first, they would eventually. Villagers paid for a number of services which benefited the townspeople only and it was a little thing to ask the townspeople, who could generally better afford it, to provide the extra cost of giving them electricity. This had been found possible in Switzerland.

While agreeing with the idea that it was most desirable that everyone should have cheap electricity available, Mr. H. Wilson, chief engineer of the Ashford Electricity Department, said it was neither reasonable, fair, nor necessary for the country people to pay as little for their electricity as the townsfolk. They did not expect first-class roads, public lighting, refuse collection, or sewerage. Why should they expect an electricity supply service equal to that in the towns? The provision of supplies in country districts was a costly business and would soon turn a profit into a loss in undertakings covering a relatively large proportion of rural area. That loss would ultimately have to be made up out of the rates. Not only would this impose a hardship on the townspeople but also on the community as a whole. The only way it was possible to have a uniform tariff was to raise it for all consumers and this would in many cases deprive the poorer classes of townspeople of the ability to make use of electricity. By a careful planning of the route of the mains and by a spread-over of the time for repaying the capital cost it was possible to give supplies without interfering with the existing facilities. Mrs. Deave demanded a subsidy from the national purse, and Miss Haslett suggested the setting up of a committee of women and supply engineers to consider the question.

Insulated Joints

HOW imperfections may arise, and how they can be guarded against, in the making of an insulated joint formed the subject of a lecture by Mr. E. A. Deacon (Dussek Bitumen and Taroleum, Ltd.) which was delivered recently before the PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.

The lecturer attempted briefly to explain molecular, atomic, electronic and ionic influences before pointing out the good agreement between the dielectric strength of air between electrodes and air entrapped in solid insulation. He showed how observation of the power-factor was a definite means of comparing the quality of two insulating materials of identical make, such as compounds, and with solid grades the power-factor measurements at various potential gradients would indicate their perfection or otherwise.

They would also show whether a cable-box, or a bus-bar chamber of compound-filled switchgear, had been correctly filled, for any sudden increase in power-factor would reveal the presence of air pockets. The thinner the air space the more gradual the change in power-factor. The actual magnitude of the power-factor was no guide; the presence of air pockets was only indicated by the sudden increase in power-factor as the air in the pockets underwent ionisation.

Preparing Estimates.—There was a large attendance at the first of the informal discussions being arranged this winter by the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS. It took place in London on October 28th, when Mr. W. H. Brooks delivered a short lecture on "Estimating." He described essential factors in building up estimates and stressed the importance of practical experience on the part of the estimator and the advisability of keeping a detailed record of jobs carried out from which much useful information could be obtained for future guidance. He exhibited graphs showing the relation of percentage costs to the whole estimate, and from a number of carefully plotted curves it was seen how a mean cost could be arrived at from work already done. The ensuing discussion was of a lively and provocative nature; "pitfalls" of which the estimator should be wary were revealed, and helpful information was imparted.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Scotching a Libel

While there have been innumerable denials of the once common scandal that Scotsmen were mean, no adequate reason for the existence of this old fallacy has, so far as I know, ever been put forward. A donation which we have received to-day, with the post-mark "Dumfries," suggests that it may be the anonymity of Scots benefaction, which accounts for the old libel. This gift took the form of a £1 Treasury note, accompanied only by a torn-out page from your issue of October 15th, which had on it Mr. Parkinson's appeal for the E.I.B.A. elaborately ringed round with red pencil.

This donor must have been most over-anxious to get his contribution to us, for it is unlike a Scotsman to employ such a risky method of sending money. However, we hope that there are others among your readers who will be moved to emulate his example, though preferably by the use of crossed cheques, postal orders or money orders, and with the addition of the name and address so that we can despatch our official receipt.

Your columns are our only means of thanking this particular donor, and I am therefore sending our official receipt to you.

H. SENIOR FOTHERGILL.
Secretary, Electrical Industries Benevolent Association.
London, W.C.1, *November 2nd.*

Earth Leakage Trips

Mr. H. G. Taylor has lifted one sentence clear of its context, but if he will read it in conjunction with the remainder of the paragraph all should become clear.

The sense of the paragraph is that a sustained leakage potential of 30 V is certainly to be avoided, whatever the earth resistance, but if a low operating time can be ensured for the protective devices, then very much higher voltages may be viewed with equanimity.

I should say that against low or zero earth resistance, even 10 volts may be too high for persistent leakage potentials, and everything turns upon the time that this is likely to be maintained.

T. C. GILBERT.
Folkestone, *November 5th.*

A.c. Motor Protection

The author of the above article in your issue of October 1st, in stating that the modern induction motor has a useful overload capacity which protection by thermal relays makes available with safety, would have done better to refer to the overloads that the average induction motor can stand rather than the figures from B.S.S.168 for 50 and 100 per cent. overload. This Specification is intended to lay down the minimum pull-out torque of which any type of motor shall be capable and stipulates that torque tests of a certain time shall be taken. It does not, however, purport to specify the maximum value of torque of which any type of motor is capable or the maximum length of time during which it can develop this torque.

In considering the operating characteristics of an overload relay, obviously the inherent overload characteristics of the motor should be used for comparison. Typical figures are quoted in the I.E.E. *Journal*, Vol. 81, No. 488. On page 159 Dr. Wilson gives 5.2 minutes at 100 per cent. overload and on page 178 (fig. 2) Mr. Knowles gives 10 minutes at 100 per cent. overload as a limiting figure for motor heating.

Test figures from a different source indicate that over a range of various types and sizes of induction motor the safe time at 100 per cent. overload varies from 5 to 8 min. A rough check of this can easily be made knowing that the heating of a motor varies approximately as the square of the current. Since all motors have to carry 25 per cent. overload for a specified time, it is not difficult to calculate the total heat generated in that time over and above the heat dissipated from the frame which is, of course, the full load losses. In the same way the total heat generated at any other load in a given time can be calculated and compared. With direct-on-line switching the starting peak may cause heating comparable to the 25 per cent. overload for the full rated period and the author's statement that since the starting peak is only momentary its heating effect is very small is unjustifiable. In many machine-tool drives, involving frequent reversals of the motor, heating due to starting and plugging may be the major factor and in some cases the heating due to the working load may even be neglected.

From the above it is obvious that a thermal relay having a generous time lag at normal working overloads is very desirable, experience showing that 5 min. at 50 per cent. overload and 2 min. at 100 per cent. overload is satisfactory, while with stalled motor current the time lag should be of the order of 10 to 20 sec. for the best results. In the U.S.A. thermal overloads are specified to trip in not more than 8 min. on 50 per cent. overload, although the long-time overload of the motors is only 15 per cent. compared with the British 25 per cent.

The author is quite correct in pointing out that the permissible overload that a motor can carry is affected by the ambient temperature, but since any properly designed thermal relay, such as has been obtainable in this country for the last ten years, inherently corrects for ambient temperature it is difficult to understand what he means by an "ambient-air temperature compensator."

The author refers to self-resetting thermal relays and thermal relays operating auxiliary contacts as new. There have been various forms of the first on the market during the last eight years, many of which have disappeared again, and by far the bulk of all thermal relays in the U.S.A. and in this country have operated auxiliary contacts. Relatively few have ever operated trip mechanisms direct, although on the Continent more has been done in the way of direct tripping of hand-operated circuit-breakers by thermal relays.

Rugby, *November 3rd.* E. H. B. MARTIN.

Domestic Refrigeration

Are the electricity supply authorities satisfied with the progress made with their electric domestic refrigerator campaign? It appears to me that if the electric refrigerator is not actually losing in its competition with its gas rival it is not progressing as it should, and gas refrigerator sales are being made that could be easily averted if the electricity concerns had been fully efficient in their sales methods.

The gas companies are sparing no effort to capture this useful load, and it seems that not yet has the electrical industry realised how thorough and intense these efforts are and how far-reaching the gas advertising is. Is it realised that at least one gas supply company will buy any electric refrigerator if a gas model is supplied in its stead?

The tower of the new London University buildings illuminated this week in honour of the visit of the King and Queen. A large number of G.E.C. projectors were employed for the scheme, which was carried out by T. Clarke & Co., Ltd.

When the gas meter reader goes into a home reading the meter is only a part of his job. Quite recently I was in a large residence attending to the somewhat old refrigerator when the gas meter reader turned up. As he passed through the kitchen it was apparent that he took all its apparatus in with a glance, all old gas cookers, hot plates and boiling rings. Before very long this man was telling the story of new gas cookers and gas refrigerators and obviously had the housekeeper interested. I heard a servant say recently: "All new refrigerators are worked by gas now, aren't they?"—not a very great tribute to the electrical industry's advertising.

A conversation with two gas fitters made it instantly apparent that the gas refrigerator had been thoroughly driven home to them, and what is more each had a commendable knowledge of the electric refrigerator, a proof of the thoroughness of their employers' training courses.

The efforts of the electrical industry to obtain first place in this market must be intensified. Employés must be trained to push the electrical product at every opportunity and must be taught something of the apparatus which they are selling. There should also be periodical refresher courses.

It is not my desire to say how it should be done but merely to express the opinion, as a service mechanic working every day in the field, that if the electric refrigerator campaign is not redoubled in intensity and efficiency then so far as that product goes electricity will have to take second place in the home. L. E. CLIFFORD.

Ewell, *November 4th.*

Inductor Speedometer for London Tubes

We are much interested in the letter from Mr. J. W. Record which appears in your issue of November 5th. He is, however, mistaken when he suggests that the speedometer described by him was "similar" to that which we are at present supplying to the London Passenger Transport Board for its electric trains. He describes what is "essentially a voltmeter method," with all the drawbacks which he enumerates, whereas we employ what is "essentially a frequency-meter method." The difference is fundamental, since the indications of a voltmeter scaled in miles per hour depend not only upon the strength of the magnet of the magneto generator forming the transmitter, but also upon changes in the position of the "armatures" and the shunting effect of neighbouring masses of iron and steel, as well as upon the demagnetising effects of the magnetic fields of the train motors, and so forth.

In the inductor speedometers as described in your issue of October 29th these variables are without effect, since the indicating instrument is a true frequency meter, the readings of which are independent for all practical purposes of the voltage.

EVERETT, EDGCUMBE & CO., LTD.

London, N.W.9, *November 8th.*

Single-pole and Neutral Gear

The popularity of single-pole and neutral fuse- and switch-gear is undoubtedly growing, not only in this country, but also abroad, as many orders are now coming in for this type of apparatus from the export market.

Several manufacturers already devote whole pages of their catalogues to single-pole and neutral gear. Many firms, however, have refrained from listing such gear, as it had been hoped that some standard form would be adopted throughout the industry. This, unfortunately, has not materialised, and supply engineers insist on their own ideas being used on their own systems, with the result that manufacturers have to supply all types of gear. The quantities required of each type are bound to be small and the consequent increase in price is in the long run to the detriment of the industry as a whole. For instance, certain engineers want single-pole and neutral switch fuses with a single-fuse and d.p. switch; others want a single fuse and s.p. switch, and some also want to fuse the neutral.

I suggest that it is high time that the manufacturers, supply engineers, and the I.E.E. got together to see if it is not possible to draw up a standard specification for single-pole and neutral gear for use in this country. CONTACT.

November 7th.

A Curious Fault

In reply to the letter from Mr. E. S. Weeks in your issue of November 5th, the shocks are due to the phase wire acting as one plate of a condenser with its potential rapidly changing from positive to negative. Consequently the lead sheathing acting as the other plate of the condenser has induced upon it a charge alternatively positive and negative, which will give a spark to earth. In the case to which he refers the varnished matchboarding provides an excellent insulator against earth.

This phenomenon is common on conduit and metal-sheathed wiring systems when the plaster, &c., is dry, and proves that the system is not in contact with the structural metalwork, which it is usual to avoid. I. F. C.

November 8th.

Improved Trolley-buses for Newcastle

Series dynamic control

THE first ten trolley-buses utilised in the initial stage of the Newcastle-on-Tyne tramway conversion scheme were of A.E.C.-English Electric make and equipped for regenerative control. The air brake only was applied by the right foot pedal, while acceleration and electric braking were controlled by the left pedal.

Six more six-wheel chassis now being supplied by the Associated Equipment Co., Ltd., are among the first of their type to be put into commission. They embody several unusual features, one of which is a patented system of series dynamic control specially developed by the English Electric Co., Ltd., to provide electric braking which is stable and easily manipulated without returning heavy currents to the overhead trolley wire, so avoiding detrimental consequences.

Use is made of a compound motor having a shunt field which is relatively light by comparison with that of the normal regenerative machine. A strong series field allows well-known advantages to be retained during motoring, while the light shunt winding alone is employed for rheostatic purposes. This provides a brake which can be applied at all speeds without risk of flashing over the motor, or overstressing the transmission, thus avoiding the shortcomings of the plain series method.

The rate of retardation is very similar in both cases, but since the series dynamic system does not return current to the line, the development of high voltage across the armature is prevented. The effectiveness of the new method is enhanced by the fact that it does not involve the use of any complicated equipment.

The electric brake connections are set up by means of a small switch operated by the right pedal and linked with the air brake control valve. In depressing the pedal the driver first operates the electric brake and continued movement of the pedal brings the air brake into action also, the transition being quite smooth.

A distinct economy in brake linings is brought about, since the driver must always make use of the electric brake before the air brake, and it is claimed that the rate of wear is reduced by more than one-half. Another advantage resulting from one foot-operation of both electric and air brakes is the flexibility of control that can be obtained, allowing the vehicle to be brought to a standstill very smoothly and accurately at stopping places.

A further speciality is the lighting generator, which is mounted directly on the main motor, the yoke being bolted to the motor end-housing while the armature is carried on an extension of the motor shaft. The speedometer is neatly built into the generator and in this way is entirely protected from road splash. The mounting of the generator on to the comparatively large mass of the traction motor, which is itself mounted on anti-vibration supports, alone ensures that no vibration or noise is transmitted to the body and the careful dynamic balancing is an added precaution. The machine cuts in at approximately 5 m.p.h. and develops its maximum output of 1,600 W at about 7 m.p.h. Thus adequate battery charging is ensured.

The vehicles are also arranged for emergency operation from the battery. The change-over switch, which connects the two halves of the battery in parallel for charging and in series for battery manœuvring, is housed in the same case as the contactor completing the motor-circuit when operating from the battery. The s.d. motor is particularly well suited to manœuvring operations from the battery as, due to the strong series field winding the drain on the battery in motoring a given distance is less than is the case with a regenerative motor, while gradients are also more readily negotiated by the vehicle.

The air brake gear is also unusual. The A.E.C. patented design of reservoir is combined with the governor, check valve and buffer chamber as a complete unit assembly, thus reducing piping and connections, and hence leakage. The recent design of high-lift brake cams and the self-locking independent adjusters for all camshaft levers must also be mentioned as these enable the liners, ¾ in. thick, to be worn out completely without any resplining of levers.

Meters and Instruments

Publication of a revised B.S.S. for electricity meters (No. 37-1937) reveals that the limits of error have been reduced wherever possible and specific provision has been made for "long-range" meters, namely, whole-current single-phase types having current capacities up to twice the marked current. Also, provision has been made for meters intended to operate over a range of voltage. The 20- and 25-A sizes have been replaced by the 25-A size and a 6,000-A type has been added to the list of standard ratings. Another revised B.S.S. just issued is No. 89-1937, which deals with indicating ammeters, voltmeters, wattmeters, frequency and power-factor meters. Second-grade instruments have been excluded, while the limits of error for sub-standard and first-grade instruments have been reduced wherever possible. More specific provision than was made in the 1929 edition has now been made for the thermo-couple, electrostatic and rectifier types of instruments. Copies of these specifications can be obtained from the British Standards Institution, 28, Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

A Welding Rectifier

A welding rectifier unit, comprising a three-phase transformer having a steplessly variable leakage field with its low-voltage winding connected to a fan-cooled rectifier, is being introduced to the British market by the A.E.G. ELECTRIC CO., LTD., 131, Victoria Street, S.W.1. Its capacity is 250 A at 32 V for 100 per cent. duty cycle and 280 A at 30 V for 70 per cent. duty cycle. In the latter case the rating is 19.3 kVA and on short circuit 35 kVA. Energy consumption is stated to be 14.4 kW at full load and 0.95 kW at no load. The power-factor rises from 0.65 to 0.82 within the range of 50 to 170 A, being 0.62 at no load. Rapid response of current and voltage to changed circuit conditions, enabling the arc to produce an even flux, is among the several advantages claimed for this type of welder.

An Automatic Toaster

Several special features are included in the design of the new toaster marketed by L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2. Instead of being put in front of the element on a rack and the lid then closed, the toast is placed in two racks which are made accessible when one end is dropped down. By means of a finger control the toaster can be set to toast the bread light, medium or dark brown. Two slices are toasted at a time, both sides at once, and the toast is delivered automatically when done. The toaster is chromium plated, with bakelite handles and feet, and it will take slices measuring 4 in. by 4¾ in. The 6 ft. art silk flexible is fitted with a push-button switch.

The Hawkins "Universal" toaster

A snack set is also available; this includes the toaster, a solid walnut tray, a clear crystal dish with five compartments, a walnut cutting block and a stainless steel knife.

Rectangular Cistern Type Heaters

The outside appearance of the new "Charlton" heater of JOHNSON & PHILLIPS, LTD., Charlton, S.E.7, follows generally the lines of the old design of rectangular cistern type heaters. The general construction is also on similar lines in that all the water containers are of specially prepared copper with welded joints throughout. The ball tank is arranged so that the inlet and overflow pipes can be run to either side of the heater, the holes not used being fitted with screwed plugs. The lagging is also carried up round the walls of the ball tank, and standard elements with the coiled-coil spiral are used throughout for this type of heater.

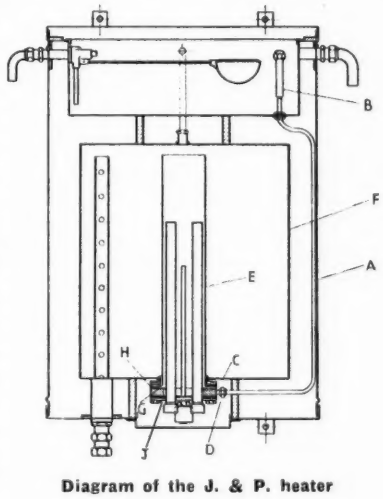


Diagram of the J. & P. heater

The improvements incorporated in the new design can best be described by reference to the accompanying diagram. The cold water feed pipe is shown at (A) and is fitted with an adjustable restrictor and air-vent (B) at its upper end and is connected at the lower end to a ring (C) by means of a union coupling (D). The ring (C) fixes the heating chamber (E) to the hot water container (F) using the bolts (G), the joints being made watertight by means of gaskets (H) made in a special graphited material. The apparatus plate (J) is fixed to the ring (C), the joint between being made watertight by means of a gasket of similar material.

Cold water enters the ring (C) somewhat tangentially and travels in a circumferential path in a horizontal plane and will tend to spread in horizontal layers in the heating chamber. By inducing a movement of the water in a horizontal plane the tendency to cause disturbance of the water in the heating chamber in a vertical direction will be minimised, as also will the mixing of the hot and cold water in this chamber. Again, the ring (C) is placed well below the bottom of the hot water container (F), and any cooling effect of the cold water entering the heating chamber on the water in the hot water container will be considerably diminished.

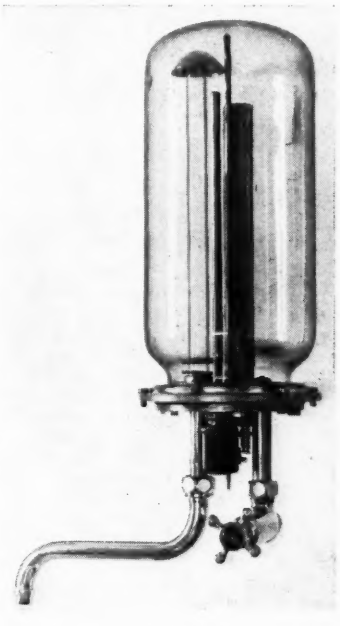
In water heaters of the kind in which the elements are situated in a separate heating chamber, such as the cistern types, when furring takes place, it is usually confined to the heating chamber and its fittings and practically no fur collects in the hot water container. In the improved design it is not necessary to empty the hot water container for descaling. Instead, the water is run out of the heating chamber by means of the drain plug or cock fitted on the apparatus plate, and when this is emptied the apparatus plate only need be removed. The ring (C) and heating chamber (E) are left in the heater and these retain the hot water in the hot water container. The heating chamber can easily be removed after emptying the hot water container and loosening the union joint (D). The ring and inner container can then be removed separately or jointly from the heater and when taken away leave the interior of the hot water container free of all obstructions and in a condition for thorough and easy inspection.

An Unusual Water Heater

"Pyrex" heat-resisting glass, pressure tested to 50 lb. per sq. in., is used for the inner container of the new "Hotric" water heater of H. WEBB & CO. (ENGINEERS), LTD., West Road, Tottenham, London, N.17.

The outer container is of 22 s.w.g. silver finished steel, butt and spot welded, with brackets riveted and spot welded. The finish is one coat of "Anodite" inside and two coats of enamel on the outside. The valve is of the screw-down pattern with capstan head, and finished in chromium plate.

The reduction valve has a patented vernier adjustment fitted integrally in the base of the inlet pipe; it is accessible by removal of the capstan valve. The patented non-return valve is noiseless, self-sealing and acts also as a diffuser. It is fitted integrally in the top of the inlet pipe. By interchanging the inlet and outlet pipes the heater can be made for either left or right hand use.



The glass container of the "Hotric" heater

The heating element is a 500-W or 750-W immersion heater 1½ in. in diameter, and the insulation is by granulated cork 1½ in. deep on the sides and 2 in. deep on top.

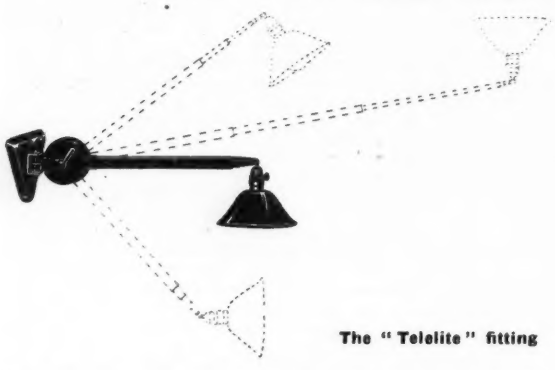
"Over-the-Counter" Lighting

The problem of how to obtain efficient glareless illumination over the shop or store counter is one which often causes a certain amount of trouble. Two designs in the new "Utility" lighting fittings range of the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, have been specially made to overcome this difficulty.

A circular opening is left in the base of the glassware (which can be either "Britalux" white opal or "Superlux"). The increase in the downward light distribution for angles between 30 deg. on either side of the downward vertical is approximately 75 per cent. greater than with a totally enclosed unit. Up to angles of 45 degrees on either side of the downward vertical the intensity is also greater. Another important feature of these fittings is that, although the unit is open, the lamp is screened and therefore there is no glare. Besides the increased light distribution the opening in the glassware facilitates lamp replacement without removing the globe from the fitting. The fittings are available in four sizes, with either bronze colour or chromium-plated metalwork.

Adjustable Lighting Fitting

The "Telelite" is a new adjustable lighting fitting which has been developed by NOVONOTIONS, LTD., 64, Victoria Street, London, S.W.1. It is designed for fixing to a wall by means of three screws and has a telescopic arm on the end of which

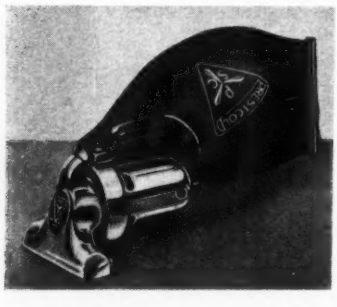


The "Telelite" fitting

the lamp and shade are fixed by means of a ball joint for tilting in any direction. The arm permits an extension from 1 ft. 9 in. to 3 ft. 9 in., the flex being contained within the tube. Models are available in black enamel or matt nickel plate.

A Portable Electric Capstan

In order to provide capstan facilities in any part of a works where a ground socket can be installed, the SADI ENGINEERING CO., LTD., 29-31, Portugal Street, Kingsway, London, W.C.2, is marketing a compact electrically driven unit which can be easily moved from place to place. The machine consists of a three-phase squirrel-cage motor overhung from a double-reduction oil-immersed gearbox through which it drives a concave friction pulley. A guide roller prevents overlapping of the rope and helps to swing round the capstan. The whole is supported by a cast-steel fork provided with an eccentric spigot and two lifting hooks mounted on, but readily removable from, a cast-iron floor socket fixed in a suitable foundation. The shaft is horizontal and so can be used up to a certain angle as lifting gear. The unit moves through 360 deg. and automatically adjusts its position to the direction of the load.

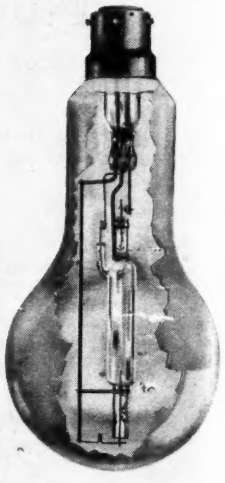


A hand vacuum cleaner by the Pressed Steel Co., Ltd., Oxford

Electric-discharge Lamps

Following the company's affiliation to the Electric Lamp Manufacturers' Association, CROMPTON PARKINSON, LTD., Bush House, Aldwych, London, W.C.2, have introduced a full range of electric-discharge lamps and lanterns.

The 80- and 125-W sizes, having light outputs of 3,040 and 5,000 lumens, respectively, are pear-shaped pearl lamps with three-pin bayonet caps

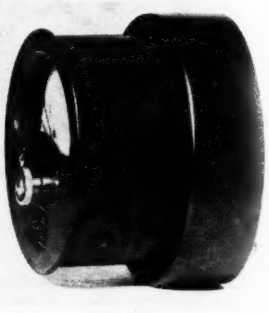


The low-wattage "Crompta" discharge lamp

and can be operated in any position. The larger sizes, 250 W and 400 W, giving outputs of 9,000 and 18,000 lumens, have clear tubular bulbs and are designed for vertical mounting with e.s. caps. Condensers, chokes and suitable lanterns can be supplied with the lamps.

Load Indicator Protection

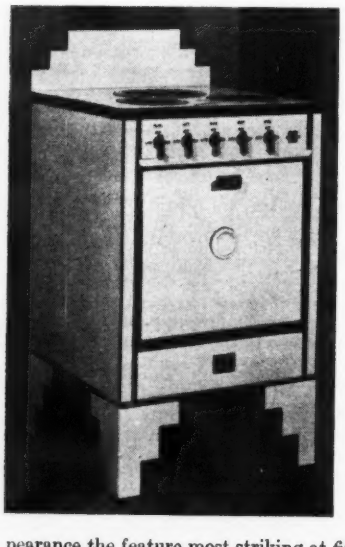
A new pattern of the long-scale load indicator of the "P. & B." ENGINEERING CO., LTD., Tamworth Lane Works, Mitcham, is designed for operation from a current transformer, which also operates an inverse-time over-current relay for tripping a high-voltage oil circuit-breaker. The danger, common to thermal indicators, that a heavy fault current may burn out the heating element (thereby causing an open circuit before the relay trips the breaker) is prevented by connecting a limiting transformer, housed in the base of the instrument, between the main current transformer and the indicator heater. The current in the secondary winding of the limiting transformer cannot exceed 20 A, which the heater will carry without damage for a few seconds, the primary winding being designed to carry the heavy current from the main current transformer under fault conditions. The indicator and limiting transformer (the additional burden due to which is about 1.5 VA) are calibrated as one unit in order to eliminate ratio error. The limiting transformer can also be supplied as a separate unit for use with any other type of indicator.



"P. & B." long-scale load indicator (current-limiting transformer pattern)

A Low-voltage Cooker

TRANSFORMER operated hot-plates are now in fairly common use, but a completely low-voltage cooker has, we believe, yet to make its appearance on the British market. In Australia, largely as a result of experimental work by Mr. W. H. Myers, chief engineer of the N.S.W. Government Railways, low-voltage apparatus for which many advantages are claimed is now being



The Myers low-voltage cooker

successfully introduced by O'Donnell, Griffin & Co., in association with the Don Electrical Co.

We have recently had an opportunity of inspecting what we understand is the only model yet brought to England. Apart from its appearance the feature most striking at first glance is the absence of the customary griller boiler, grilling being done on the floor of the oven. The 2,750-W oven element, which is of a heavy gauge bare wire giving a visual heat, runs backwards and forwards horizontally about 2 in. above the bottom tray. It is supported on a fireclay surround and is pinned to avoid damage.

The oven reaches 500 deg. F. from normal kitchen temperature in approximately 7 min. and retains its heat for a considerable time. It is claimed to effect a saving of one-third in the cost of electricity.

No special utensils are required for the three circular hot-plates provided, which, like the oven elements, are of the radiant type consisting of a continuous length of heavy-gauge wire mounted snakelike on a fireclay former and held in position by means of pins. With an ordinary kettle two pints of water can be boiled in 6-7 min. on the medium plate loaded at 1,500 W, and we were told that it is possible to reduce this time to 4 min. by altering the tappings on the transformer. For simmering a 600-W plate is provided and the third and largest plate is loaded at 2,500 W. All hot-plates are guaranteed for two years.

The transformer, which is mounted under the cooker, is asbestos insulated and has an earthed metal plate between the primary and secondary windings eliminating the possibility of the full mains voltage reaching the cooker; this renders it practically shockproof. Fuses are fitted on the primary side of the unit only. The potential across the transformer secondary at which the cooking normally operates is 32 V, but the transformer is tapped in such a way that by turning any one or all the switches to "half," the voltage across the appropriate element or elements is reduced to 16 V, the radiation being lowered accordingly. A separate 32-V plug socket enables kettles, vacuum cleaners, &c., to be operated with complete safety.

A Flourishing Industry

Speeches at the B.E.A.M.A. dinner

THIS year's annual dinner of the British Electrical and Allied Manufacturers' Association must have attracted the largest gathering for such a function in electrical history—to say no more than that. Lord Derby, the President, presided over a company of more than 1,000 members and guests at Grosvenor House, Park Lane, on November 4th.

The principal guest, among many other distinguished men, was Sir Samuel Hoare, the Home Secretary, and to him was entrusted the first toast "The Electrical Industry." Sir Samuel said that the industry represented at that dinner had the most interesting history and most remarkable development of any industry. Only a generation ago a predecessor of his introduced a Factory Bill in which the only mention of electricity was the phrase "electrical stations," relegated to the very end of a schedule. The latest Factory Act introduced electricity in almost every section. He congratulated the industry upon the part which it had played in bringing about the present national prosperity. It was, he hoped, now making good profits. He was not one of those people who considered that profit-making was iniquitous; unless an industry made profits there was no money for the wage-earners.

> *While enjoying prosperity at home manufacturers must not neglect their overseas business*

He thought that we, in this country, were too apt to depreciate any successes which came to us. Consequently, although we had a remarkable record, many people in the world had not realised the magnitude of our achievement. He maintained that in the past few years we had accomplished the most remarkable piece of economic development in history. There were people going about muttering that this prosperity could not last—a slump was on the way or there would be war. Talk of the inevitability of war was almost criminally dangerous. The British Empire had to teach the world common sense and ensure that it was so strong as to make it impossible for anyone to start a war. The Government would continue to pursue a policy of appeasement and reconciliation in international affairs.

The Government's domestic policy was to provide the conditions in which industry could flourish; it did not presume to teach manufacturers their business. They had been attacked for not planning for the future, but "planning" as a rule meant the production of vast paper schemes with a hypothetical basis. He claimed that the Government's tariff policy was an example of planning; it had protected the home manufacturer and made possible agreements with other countries. Cheap money had been another benefit which the Government had bestowed upon industry.

Sir Samuel urged manufacturers who were enjoying prosperity in the home market not to neglect their export business. If they once lost clients it might be years before they got them back.

Spreading Prosperity

In the course of his response to the toast, Sir Felix Pole (vice-president) mentioned that the electrical industry provided employment for 400,000 people, and £700 million was invested in manufacture and supply alone. The manufacturing section now ranked fifth in output among British manufacturing industries. The electrical industry as a whole affected the economic life of the nation to a greater extent than any other similar group of industries.

Sir Felix recalled that at the annual dinner eight years ago he appealed to the Government to abandon the policy of free trade; to-day we had the benefit of limited protection of home industries and without this the country would not be enjoying the present measure of prosperity.

The industry was responsible for the welfare of about a million persons (including employés' dependants) and it therefore should endeavour to maintain reasonable stability of employment. This could be done by the exercise of foresight and co-operation to prevent the growth of excessive productive capacity in good times and to ensure a reasonable degree of utilisation of normal production in bad times. Whenever possible orders should be distributed evenly over fairly long periods, bearing in mind that heavy plant took some time to manufacture. Every supply engineer liked as high a load factor as possible; electrical manufacturers had a similar preference.

Much of the work that was now being done could have been put in hand during the slump. It should not be beyond the wit of man to prevent abnormal prosperity as well as abnormal adversity. He asked the Government to endeavour to bring together all those concerned to see what could be done in this direction. One essential of any such discussion was that each industry, or section of an industry, should have a strong association to which every member of the industry should belong.

The Benefits of Association

He could say a good deal in defence of what were sometimes rather offensively called "rings." Every trade association must be prepared not only to represent its members in matters affecting the industry, but also to answer for its members and safeguard customers from even a tendency to exploitation. He knew of no such tendency in the electrical industry, however. He was glad to say that the Government recognised that cheapness was not to be regarded as the only criterion in the acceptance of tenders.

The electrical industry was highly technical and scientific, and vast expenditure upon research and development was essential. It was an industry which could only secure export business by quoting extremely low prices and to such an industry a sound home market was of the first importance.

After a reference to the proposed reorganisation of electricity distribution, Sir Felix concluded by expressing his complete confidence in the future of the industry.

The health of the guests was proposed by Mr. V. Z. de Ferranti (member of Council), who said that Sir Samuel Hoare's presence was most appropriate. The Home Office looked after their factories and the home was the place in which electricity could bring the greatest blessings to the people. He trusted that the proposed Distribution Bill would free the industry to enable it to go forward to even greater prosperity. The magnitude of the manufacturing side of the industry was a tribute to the skill and efficiency of the supply section. With the help of the scientists, who were also represented, they hoped to continue to make existing generating plant obsolete and thus secure a continuation of orders.

In responding on behalf of the guests, Brig.-Gen. Sir Harold Hartley, F.R.S., referred to the World Power Conference as the child of B.E.A.M.A., mentioning the part played by the late Mr. D. N. Dunlop in its inception. He thanked the Association for its support in this work, which aimed at international co-operation and understanding.

Mr. J. L. Wilson, chairman of the Association, proposed the health of the President, who, he said, had now occupied that position for fifteen years with the confidence and highest esteem of every member of the Association. Lord Derby, who was greeted with vociferous applause, made a happy reply.

From so large a company it is hardly possible to select for mention the many men of distinction in the various branches of the electrical industry and profession who were present. We must therefore be content to record that officially we are informed that the guests of the Association included the following:—

Sir Noel Ashbridge, Sir Percy Ashley, K.B.E., C.B., Mr. G. Balfour, M.P., Sir William H. Bragg, O.M., K.B.E., F.R.S., Mr. D. A. Bremner, O.B.E., Mr. A. E. L. Chorlton, C.B.E., M.P., Sir Geoffrey Clarke, C.S.I., O.B.E., Mr. D. James Davies, C.B.E., Mr. S. B. Donkin, Mr. J. W. Dulanty, C.B., C.B.E., Alderman J. Chuter Ede, M.P., J.P., D.L., Mr. H. C. Gordon, Lt.-Col. J. H. M. Greenly, C.B.E., Mr. T. St. Quintin Hill, C.M.G., O.B.E., Mr. Harold Hobson, Mr. J. A. B. Horsley, O.B.E., Mr. R. S. Hudson, M.P., Sir Montague Hughman, Sir Cyril W. Hurcomb, K.B.E., C.B., Mr. J. M. Kennedy, O.B.E., Ex-Provost Sir William Lang, J.P., Sir William Larke, K.B.E., Mr. R. E. L. Maunsell, C.B.E., the Right Hon. Lord May, K.B.E., Mr. G. C. Morley New, Mr. F. H. Nixon, C.B., the Hon. S. M. Lanigan O'Keeffe, C.M.G., Sir Leonard Pearce, C.B.E., D.Sc., Eng.-Vice-Admiral G. Preece, C.B., Mr. J. S. Pringle, O.B.E., Colonel Sir Thomas F. Purves, O.B.E., Dr. Alexander Russell, M.A., D.Sc., LL.D., F.R.S., Dr. F. S. Sinnatt, C.B., M.B.E., D.Sc., Sir Frank Smith, K.C.B., C.B.E., F.R.S., Mr. H. W. Swann, Sir John E. Thornycroft, K.B.E., Sir Henry Tizard, K.C.B., F.R.S., Dr. H. J. Van der Bijl, Sir Ralph L. Wedgwood, C.B., C.M.G., Sir Evan Williams, Bt., D.L., and Mr. H. G. Williams, M.P.

It may be added that a feature of this year's dinner was an alteration in the customary seating arrangement. By placing all diners at small individual tables, a less formal atmosphere marked the proceedings as one was afforded an opportunity of making contact, if one so desired, with others besides one's own immediate neighbours. Guests of the Association were accommodated at tables at which B.E.A.M.A. vice-presidents and Council members acted as hosts.

Some Promising African Markets

Optimistic official forecasts

THANKS to activity in the production of gold and other minerals, combined with a recovery in the demand and prices for a number of raw materials, there has been a continued revival in trade in Nigeria, the Gold Coast, Southern Rhodesia, Kenya and Uganda, and (though to a smaller extent) in Tanganyika.

In his recently published review of the trade of Nigeria the Comptroller describes 1936 as a remarkable trading year and expresses the belief that 1937 will be even more successful. In his view every aspect is satisfactory—imports, exports, favourable trade balance and revenue.

With regard to general prospects on the Gold Coast, the official trade report for 1936, in recording a most successful year due to high prices paid for the products of the territory, states that if world conditions remain steady the import trade of 1937 should surpass that of 1936.

Recent reports from Southern Rhodesia speak of favourable conditions generally. Activity in the building trade has been maintained, and the mineral output of the territory has been increasing. The foreign trade returns available so far this year show increases in both imports and exports, more especially the latter. In Tanganyika gold production has been on the up-grade and general trade throughout the territory is reported to have improved.

Writing in March last on the trade position, the Commissioner of Customs for Kenya and Uganda said that the figures for 1936 could justifiably be accepted as evidence of the emergence of the territories from the period of depression and the achievement of a standard of agricultural development and resultant commercial activity satisfactory to the interests of all concerned. In no previous year had a forecast of trade prospects been possible with the measure of confidence that could be expressed in regard to 1937. Trade had steadily and firmly arrived at and established itself in a position which could be judged as particularly satisfactory, and there was adequate indication that this position would be maintained.

In the accompanying statements, extracted from the official trade returns of the respective territories, are shown the leading items of electrical imports in 1936, with notes of increases or decreases compared with the preceding year.

	1936. £	Inc. or dec. on 1935. £
NIGERIA.		
Electrical and telegraphic apparatus—		
Total	44,050	+ 13,330
From United Kingdom ...	18,600	+ 7,670
„ U.K. Government ...	14,600	− 1,170
„ United States ...	3,220	+ 900
Electrical machinery* ...	7,060	+ 3,620
GOLD COAST		
Electrical and telegraphic apparatus—		
Total	94,000	+ 28,000
From United Kingdom ...	75,300	+ 22,300
„ Hong Kong	6,000	+ 3,000
„ Germany	5,100	+ 2,100
„ United States ...	2,600	− 400
„ Japan	2,000	—
Electrical machinery*		
Total	200,000	+ 101,000
KENYA AND UGANDA.		
Electric wire and cables—		
Total	17,500	+ 2,400
From United Kingdom ...	13,800	+ 3,100
„ Germany	500	− 2,600
„ Belgium	3,000	+ 1,700
Lighting accessories and fittings—		
Total	5,800	− 2,100
From United Kingdom ...	3,800	− 3,300
„ Belgium	1,700	+ 1,200
Electric light bulbs—		
Total	3,200	− 300
From United Kingdom ...	2,800	− 80
„ Japan	—	− 90
Electrical goods and accessories not elsewhere specified—		
Total	29,200	+ 7,400
From United Kingdom ...	20,600	+ 4,400
„ Hong Kong	1,600	+ 600
„ United States ...	1,400	− 100
„ Germany	1,900	+ 1,100
Telegraph and telephone material—		
Total*	17,200	+ 7,100
Radio apparatus—		
Total	18,900	+ 2,700
From United Kingdom ...	5,500	− 3,100
„ Holland	2,900	+ 1,100
„ United States ...	9,400	+ 4,100
Electrical machinery and parts—		
Total	27,600	− 5,500
From United Kingdom ...	19,900	− 4,300
„ Germany	2,100	− 100
„ Belgium	3,200	+ 2,600
„ United States ...	1,300	− 100
SOUTHERN RHODESIA.		
Electric cable and wire—		
Total*	49,000	+ 12,000
Government imports ...	6,100	+ 3,700
Electric lamps—		
Total*	14,000	− 2,000
Electrical material not elsewhere enumerated—		
Total	30,000	+ 5,000
From United Kingdom ...	14,400	+ 400
„ Canada	4,800	+ 800
„ Germany	1,200	− 800
„ United States ...	2,700	+ 700
Radio material and apparatus—		
Total	43,000	+ 12,000
From United Kingdom ...	7,800	+ 3,800
„ United States ...	22,400	− 600
„ Holland	9,600	+ 200
Telegraph and telephone material and instruments—		
Total*	1,000	—
Batteries—		
Total	17,700	− 1,300
From United Kingdom ...	12,300	− 1,700
„ United States ...	4,000	—
Motors—		
Total	31,000	− 8,000
From United Kingdom ...	1,300	− 300
Transformers—		
Total*	13,500	+ 6,500
Other electrical machinery—		
Total	65,100	− 3,900
From United Kingdom ...	55,900	− 100
„ United States ...	5,000	− 4,000
„ Germany	2,900	− 200
TANGANYIKA.		
Electric light bulbs—		
Total	1,200	—
From United Kingdom ...	370	− 170
„ Germany	490	+ 210
Insulated wires and cables—		
Total	3,500	− 3,350
From United Kingdom ...	3,100	− 720
„ Germany	300	− 2,700
Electric wires and cables, uninsulated—		
Total*	12,000	− 3,000
Telegraph and telephone instruments and apparatus—		
Total*	3,000	+ 2,860
Radio apparatus—		
Total	10,900	+ 2,000
From United Kingdom ...	1,600	− 2,400
„ United States ...	6,900	+ 4,100
„ Germany	1,200	+ 660
„ Holland	1,000	+ 410
Electrical goods and apparatus not elsewhere specified—		
Total	19,900	+ 900
From United Kingdom ...	15,300	− 700
„ Germany	1,900	+ 810
„ Japan	710	− 60
Electrical machinery and parts—		
Total	20,200	− 24,400
From United Kingdom ...	17,400	− 22,470
„ Germany	2,100	− 1,300

* Mainly from United Kingdom.

The Team Valley Trading Estate

THE Trading Estate which is being established on model lines at the Team Valley, Dunston-on-Tyne, by the North-Eastern Trading Estates, Ltd., is developing rapidly and in twelve months, twenty-two factories have been built and occupied and thirty-four more are in various stages of construction or have been planned. These factories are of a varied character, including electrical engineering works.

During a recent visit, interesting particulars were obtained of the estate which is the first of its kind in several respects, and a good idea was formed of what the estate which has an area of 700 acres will be like when it is fully developed. The factories now working have been designed and built on the most modern lines.

The scheme was promoted for the purpose of establishing light industries in the North-East area and it is under the control of a public company of which Col. K. C. Appleyard is chairman and which is financed by money lent by the Commissioner for Special Areas. Within practically a year, what was derelict and unused ground has been converted into a hive of industry which will be extended and developed eventually to provide employment for about 40,000 persons.

The estate is two miles in length and about three-quarters of a mile in width and will have seven entrances and adequate rail access, and all necessary amenities for the employés and the general public. Up to the present £700,000 has been spent on the engineering work on the estate and £300,000 on the buildings and a large central administration block is in course of erection. Over three miles of concrete carriageways have already been laid and the contract for lighting the roads has been let to the Metropolitan-Vickers Electrical Co., Ltd.

Temporary lighting which has proved satisfactory is employed at present. This consists of thirty-four 1,000-W floodlight projectors erected on poles. The permanent lighting will be by horizontal electric discharge lamps. The Metro-Vick Co. is also designing other special lighting for the estate.

Other electrical firms who are carrying out equipment and lighting of factories on the estate are Robson & Coleman, Falconar, Cross & Co., Reid Ferens & Co., Dixon & Barker, and Devereux Moodie, Ltd., all of Newcastle. Mr. T. H. Heslop is consulting electrical engineer to the estate. The whole of the administrative block will be lighted and heated by electricity and electric cookers are to be installed.

No power station has been provided on the estate as a supply on satisfactory terms is being obtained from the North-Eastern Electric Supply Co., Ltd.

Speaking at a luncheon following the inspection of the estate, at which Col. Appleyard presided, Sir Frederick Marquis made an appeal to manufacturers to take some hand in helping Special Areas. Labour was much less mobile than it was during the last great depression; the Trading Estate was proving that industry could be more mobile than labour and he appealed to business men to come to the estate and see for themselves what was being done and the facilities which were provided.

Col. Appleyard referred to the big area the trading estate could supply and mentioned that they were starting another estate at Sunderland and one at Bishop Auckland.

Parliamentary News (BY OUR SPECIAL REPORTER)

A Derbyshire Farm Experiment

On November 2nd Sir Percy Hurd asked the Minister of Transport whether, in framing the forthcoming legislation to extend and cheapen electricity for farm uses, he was noting the action of a Derbyshire power company, acting on the suggestion of the Rural Community Council of Derbyshire in giving special experimental facilities on one selected farm; what had been the results of this action; and whether he would encourage similar action by power companies in other areas.

Captain A. Hudson said that he had noted this promising experiment with interest and hoped it would be adopted in other areas. One object of the reorganisation which the Government had in mind would be to facilitate progressive development in rural areas, so far as was practicable.

Guarding Live Rails

On November 3rd Brigadier-General Clifton Brown asked the Minister of Transport whether he was aware that fatal accidents to children had continued to occur from contact with the live rail on the Southern Railway system; and what steps he had taken to ensure adequate protection by the railway authorities against this danger.

Mr. Burgin said he had been in communication with the Southern Railway Company regarding this matter and had received a statement which would be circulated.

The statement was to the effect that the company had decided to install, under certain conditions, two improved types of fencing which embodied the use of chain-link meshing. Considerable lengths of the new fencing were to be ordered and erection would be put in hand without delay when the material was received. Special arrangements would be made in all places in the electrified area where trespassing was prevalent, and consideration was also being given to the modification of the fencing in those parts of hunting country where there might be special risk of hounds getting on to the line.

The Distribution Bill

Mr. Ridley asked the Minister of Transport if he would state when the Government proposed to introduce legislation to implement the proposals contained in the White Paper on electricity distribution.

Mr. Burgin said he could not add to the announcement made in the King's Speech.

Meter Rents

On November 4th Mr. Hepworth asked the President of the Board of Trade whether he was aware of the heavy rates charged for meter rent, both by gas and electricity companies; and whether he would take legislative steps to make this charge more commensurate with the cost of supplying and maintaining the meters.

Capt. Wallace said he had no reason to think that gas companies generally charged meter rents in excess of the costs of supplying and maintaining the meters. The question of electricity meters was one for the Minister of Transport.

The Television Service

In reply to a question by Mr. Hall Caine on November 8th, the Postmaster-General said that he was informed by the British Broadcasting Corporation that the capital expenditure incurred on the television service up to September 30th, 193-, less depreciation written off, was £112,000, and that the revenue expenditure up to that date, including depreciation and programme, engineering, and staff costs, was £346,000.

Cost of Foreign Broadcasts

Asked by Lieutenant-Commander Fletcher, by whom the cost of additional equipment, necessitated by the foreign broadcasts scheme, would be borne and when these broadcasts would begin, Major Tryon said the cost would be borne by the B.B.C. The proportion of licence revenue payable to the Corporation would be subject to review in the near future in consequence of the development of television, and in any such review the expenditure incurred on the new service would be taken into account. An announcement concerning the introduction and scope of the service would shortly be made by the Corporation

Broadcast Relay Station at Southampton

Mr. Graham White asked the Postmaster-General whether a decision had been reached as to the establishment of a broadcast relay station at Southampton; and if it was proposed to acquire any existing plant for this purpose.

Major Tryon said that the question of the establishment by the Post Office of an experimental broadcast relay service at Southampton was under consideration, but the arrangements had not yet been completed. No such service was at present operated in the area in which the proposed experiment would be conducted, and the question of acquiring existing plant did not, therefore, arise.

Alleged Nuisance at Barking

Mr. Parker asked the Minister of Transport on November 8th whether he was aware that considerable annoyance was caused to the inhabitants of Barking and district by the smoke from the Barking power station; and why the same high standard of smoke cleansing in force at Battersea had not been introduced at Barking even in the recent extensions of plant.

Captain A. Hudson said that this matter was under observation. In connection with a recent extension of the Barking station, the Electricity Commissioners attached to their consent a condition requiring all reasonable precautions to be observed as regarded the elimination of smoke and grit in the use of the extended boilers and plant.

In the Courts

Claim for Assisted Wiring

At Lancaster last week Messrs. L. E. Wilson & Co., Ltd., electrical engineers, Manchester, claimed £6 3s. 5d. from Fred Elliott, Skerton, Lancaster, the balance of money owing for wiring a Corporation house, of which Elliott was tenant.

It was stated that the plaintiffs operated a scheme of assisted wiring on the hire-purchase system for £15 3s. 4d. on a weekly instalment basis of 1s. 2d. spread over five years. Elliott kept up his payments regularly until April this year and then ceased, apparently because he heard that the Lancaster Corporation was going to wire houses in his road without cost to the tenants. Negotiations were opened between the plaintiffs and the Corporation respecting the houses that had already been wired under the assisted scheme, and the Corporation agreed to pay up to a maximum of £5 6s. per house to those tenants who had entered into an agreement with the plaintiffs to wire their houses.

Elliott was under the impression that the sum paid by the Corporation could be used for the payment of instalments in future, but the plaintiffs contended that as Elliott was already in arrears with his instalments they were entitled to recover a capital sum of £11 9s. 5d., less the £5 6s. received from the Corporation. Elliott maintained that the sum of £5 6s. paid by the Corporation to the plaintiff company ought to be for the payment of future instalments.

By consent, Judge Peel gave judgment for plaintiffs for payment by instalments of 3s. per month.

Fraudulent Abstraction of Electricity

At the County Police Court, Birkenhead, on November 4th, Alfred Voyce, radio engineer, was summoned for unlawfully connecting a cable or wire to the Corporation's supply system. It was stated for the Corporation that the defendant had taken over premises in which the meter had been sealed. Shortly afterwards lights were seen and a radio set was heard by Corporation meter inspectors. Upon gaining entry to the house they found that the seals had been removed from the meter. In the meantime the defendant had applied for a supply of electricity. A solicitor for the defence maintained that the Corporation had not made out a case against Voyce. The magistrates, however, found the case proved and imposed a fine of £5.

Edgar Midgley, of Nelson, was fined £5 at Reedley on November 3rd for fraudulently injuring and detaching the sealing device of an electricity supply meter at a house of which he was formerly occupier. Mr. R. C. Hammersley, electrical engineer to Brierfield Council, stated that on examining the meter when the house was empty he found that the seal on the service cut-out had been removed, holes in the lead seal prised open, the sealing wire replaced and the lead seal squeezed with a pair of ordinary pliers. When a seal was removed the supply could be cut off from the meter. Wires could also be inserted in the top of the service cut-out and electricity used without it passing through the meter.

Defendant stated that in the middle of June he was experimenting with a wireless set when there was a "fuse." Thinking he would not be able to get it repaired by Council workmen, and as he did not want to be without light during the week-end, he took the seal off, repaired the fuse himself and resealed it. He did not report the matter because he forgot all about it.

Stating that the magistrates regarded defendant's act as a deliberate attempt to obtain electricity without paying for it, the chairman said the fine would have been much heavier if Midgley had been in work.

Winding-up Petition Dismissed

In the Companies Court on November 8th Mr. Justice Simonds had before him a petition for the compulsory winding-up of the Power Construction Co., Ltd., on a creditor's petition.

When the petition was called on his Lordship was informed by counsel that an arrangement had been arrived at satisfactory to both parties and he asked that the petition should be dismissed without any order for costs, and, his Lordship assenting, an order to that effect was made accordingly.

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Originality at Hendon

Canadian cooking was the feature of the second International Cooking Demonstration held last week by the Hendon Electric Supply Co., Ltd. This demonstration was one of a series being given on the first Wednesday of each month. A talk on life in the country chosen is given by a native of that country, followed by a demonstration of cooking the country's characteristic dishes. The first of the series was Italian, and Polish, Danish, Portuguese, Rumanian and Czechoslovak demonstrations have been arranged. With the help of Mrs. Spence, who selected the speakers and menus, the demonstrations have been organised by Mr. C. P. Henzell, publicity manager of the Electric Supply Corporation, Ltd., and given by Miss Woodford, the resident demonstrator. Originality is the characteristic that Mr. Henzell seeks in all his advertising efforts, both of this kind and in the local Press, and he has already doubled the attendance compared with ordinary cooking demonstrations. At Haywards Heath recently he staged a four-course dinner prepared entirely from raw ingredients and demonstrated by a chef instructor. In this area, he tells us, he proposes to stage a debate with Miss Ann Marvel that "Women do More Work in the Home than they Need." The debate will be open to the public for the discussion.

Swiss Electrical Trade

Figures for imports and exports of electrical apparatus for the first quarter of 1937 which have been published by the Swiss Treasury Department show very satisfactory improvements in external trade, the export total being 10,877,000 Swiss fr. against 8,720,000 fr. in the corresponding period of last year. Imports are given as about 4,000,000 fr., as compared with 3,500,000 fr. Electric lamp imports are particularly good (329,000 fr., against 162,000 fr.). The most important decline on the export side was in telephone apparatus, and there were also slight decreases in instruments, machines and equipment for motor cars. The biggest increases in imports were in radio apparatus, electrical instruments and electric lamps.

Lighting a Scottish Club

The Piccadilly Club, Glasgow, was first opened as a dance club ten years ago. Early this year, following a fire, it was decided to redesign the premises and bring them up to date. The main ceiling of the dance hall is in stepped formation, with four cornices each 65 ft. in length. Each cornice houses three "Osira" fluorescent tubes, red, green and blue, making a total of 789 ft. of tubing. This is energised by twenty-four transformers, and a wide range of colour effects is obtained by controlling the six hand-operated sliding resistance-type dimmers. Fifty-six indirect lighting fittings, utilising "Osram" architectural lamps, are installed in the columns surrounding the dance floor, and these can be used as an alternative to the main ceiling lighting. A number of indirect lighting brackets with illuminated pink rods are fitted to the side walls, and these are so wired that they can be used as a complete unit or with the glass rod partition illuminated separately. Ten plate-glass units with sand-blasted relief are fitted to the balcony top. Pelmet lighting is introduced to break the heaviness of the gable remote from the band setting, and immediately in front of the three illuminated curtains is a decorative illuminated wood pylon finished in gold leaf; this lighting is supplemented by two ceiling fittings, each carrying four "Osram" architectural lamps in a green cove and three 60-W pearl lamps in a champagne trumpet. The general lighting of the lounge is obtained from nineteen pendant fittings with chromium-plated metalwork, sand-blasted glass discs and pink glass rods, supplemented by a number of wall brackets. In the ladies' toilet-room there are a number of internally illuminated mirrors and large cheval mirrors with architectural lamps mounted above in chromium-plated panels. General lighting is by five chromium-plated ceiling fittings, with pink-flashed opal glassware with a relief of two silver lines. Ceiling fittings with two suspended semi-circles of architectural lamps are installed in the entrance hall and on the landing, while the stairs from the landing to the dance hall are illuminated by two two-light fittings. The complete scheme was supervised by Mr. W. A. Elder, of Cosmos Decorators, Glasgow. The illumination scheme was entrusted to the General Electric Co., Ltd., and the installation work was carried out by T. Fairlie & Co., Ltd., electrical contractors of Glasgow.

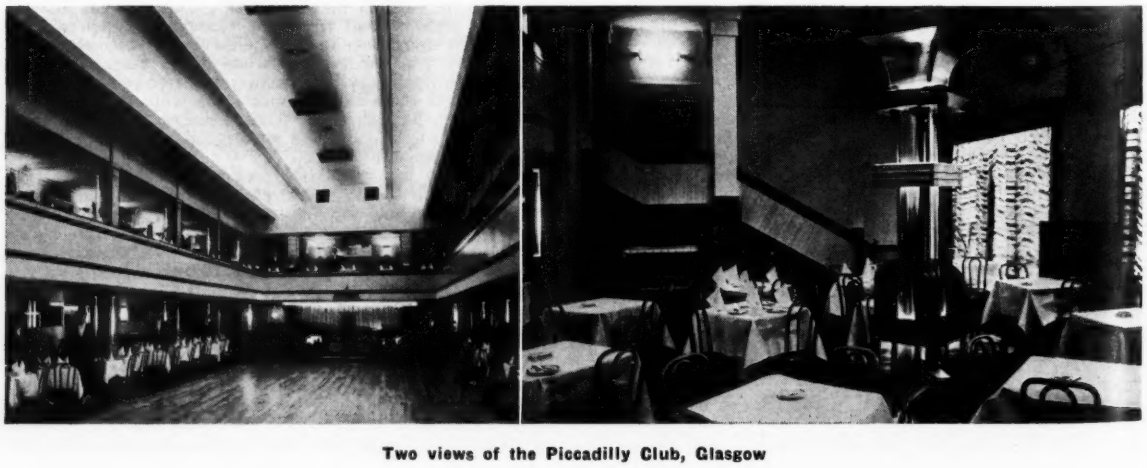
A Reigate Exhibition

The accompanying illustration shows the Reigate Corporation Electricity Department's stand at the Home and Fashions Exhibition held recently at Redhill. The stand was entirely devoted to electric cooking and water heating, and in the centre was a large tank of water heated electrically, and illuminated by architectural lamps, with a fountain playing in the centre. The effect of this when the water was heated was to cause a column of steam to rise from the jet of water, and the display proved a great attraction. The purpose of this display was to draw attention to the "Charlton" water heaters which are hired out by the undertaking. On each side of the tank were cookers which can be hired. A free competition which was arranged attracted 700 entries, and proved an effective method of obtaining names and addresses of interested consumers.

Reigate Electricity Department's stand at the local Home and Fashions Exhibition

Brazilian Electrical Imports

Although, since the operation of the German-Brazil compensation trading arrangement, Germany has greatly increased her sales of locomotives and textile machinery in Brazil, the



Two views of the Piccadilly Club, Glasgow

same cannot be said of electrical plant and accessories. The British Chamber of Commerce in Brazil, in its monthly bulletin, gives extracts from the official foreign trade returns illustrating this point. Germany still heads the list of suppliers of dynamos and generators with a contribution last year valued at £116,000 out of a total of £277,000 with the United States second and the United Kingdom fourth (£21,800). Great Britain, however, has overtaken Germany in the transformer trade, imports of which have increased nearly fourfold since 1934, while the United States leads in motors and accessories. Last year imports of telegraph and telephone material were £439,000 in value, in which Belgium shared to the extent of no less than £219,000; in this trade Canada figured with £55,500. Imports of accumulators and batteries were only £33,000 in value, the United Statees the principal supplying country.

Arc Welding

A book of four pages in which the case for electric welding is stated convincingly has been issued by Philips Industrial, Ltd., under the title of "Why Not Weld Electrically?" While not a technical or instruction manual of the ordinary kind, examples quoted should be of practical interest to the engineer, especially to one who is looking for arguments in developing this class of load. Cost and other comparisons are made with oxy-acetylene welding, riveting and casting for constructional work.

Works Visit

The annual Cutlers' Feast of the Cutlers' Company, of Hallamshire, was held in Sheffield on November 1st, and the following day the guests visited the works of James Neill & Co. (Sheffield), Ltd., the managing director of which, Col. F. A. Neill, D.S.O., T.D., is Master Cutler, and were shown some of the many phases of the company's activities, including the production of hacksaw blades, permanent magnets, "Composite" steel and iron. Subsequently the guests were entertained to lunch at the Cutlers' Hall by the Master Cutler.

An Advertising Material Exhibition

An exhibition of advertising display materials collected from advertisers all over the country as a result of a competition organised by Masson, Seeley & Co., Ltd., is to be opened to-day at 158, New Bond Street, London, W.1.

Christmas Decorations

"Osram" nursery-rhyme bells

Once again the General Electric Co., Ltd., heralds the approach of Christmas with a folder (O.S.8224) illustrating and describing its decoration and party lights. In addition to its Christmas-tree lights the company has produced a set of twelve illuminated bells, each of which bears a nursery-rhyme illustration. The bells are of a translucent non-inflammable material, beautifully coloured. A miniature Christmas tree, a cake-stand and a centre light fitting all make use of small coloured lamps in an ingenious fashion.

The lamp sets which are supplied with these decoration schemes comprise twelve 19-W miniature "Osram" lamps in series, which can be used on voltages ranging from 200 to 250.

The Mazda "Mickey House" decoration lights, which were introduced last year, have been reduced in price. A full coloured leaflet is now available dealing with "Mazda" decoration lights, space being provided for overprinting dealers' names and addresses.

Instruments Stolen

The Automatic Coil Winder & Electrical Equipment Co., Ltd., informs us that a number of its instruments were stolen from a car in Islington on November 2nd. They were as follows:—Universal "Avometer" (No. 66—5454); d.c. "Avometer" (No. 6594); universal "Avominor" (No. U.23257-46); d.c. "Avominor" (No. 41931—46); "Avo" oscillator (No. 3150); an "Avodapter"; an "Avocoupler"; "Avo" exposure meter (No. 14015—107); Smethurst high-light meter (No. H.1012—67); "Avo" light meter (No. H.1020—37); and two "Zeva" irons (Nos. H.16 and G.109). The company has a "black list" upon which it records the serial numbers of stolen instruments, most of which are returned for repair in due course. Upon their receipt the company advises the original purchasers.

Trade Announcements

Hugh J. Scott & Co. (Belfast), Ltd., motor and dynamo manufacturers, have opened a branch office and stock depôt at 24, Fountain Street, Manchester, 2, where stocks of all standard motors up to 25 h.p. will be carried. The office will also deal with quotations for motors up to 250 h.p., which is the present limit of the range. The company is now completing an extension to its works giving more than one-third additional floor area.

The Foster Engineering Co., Ltd., has opened a branch at 10, King John's Chambers, Bridlesmith Gate, Nottingham, under the managership of Mr. A. R. Miller.

Clifford & Snell (Eng.), Ltd., have recently put into commission an extension of their works at Sutton, Surrey.

A "Mazda" window display at Crown House, Aldwych, London, showing several unlighted lamps of appropriate type in each of the illuminated lamp-shaped compartments

An Electric Bicycle

Messrs. Philips of Eindhoven, Holland, referring to a note bearing this heading in our issue of October 29th, inform us that the bicycle mentioned was developed by them a considerable time ago. As there was no demand for it manufacture was discontinued almost immediately and no attempt has been made since then to revive it.

Tunisian Import Duty Changes

The duties imposed on dynamo-electric machine armatures and certain detached parts of the electrical machines of foreign origin imported into Tunisia have recently been increased by about one-fourth. On the other hand, the duties on imports of other than French wire, cable and cord for electrical purposes have been reduced. In both cases material of French manufacture continues to be exempt from import duty.

New Electricity Showrooms

New showrooms and offices for the Brentwood District Electric Co., Ltd., are nearing completion in High Street, Brentwood, Essex. A frontage which at one time was occupied by three small shops will be occupied by the ground-floor showrooms and entrance, while on upper floors there are to be modern offices. Neon signs will decorate the front of the building, which is being finished in a light-coloured stone facing and will be one of the most up-to-date in the main shopping street of the town.

Municipal Trading at Finchley

At a recent meeting of the Finchley Borough Council a recommendation of the Electricity Committee that the Council should exercise its powers to sell electrical apparatus at its showrooms was rejected by twelve votes to nine. In a report submitted to the Council the borough electrical engineer stated that a strong desire had been expressed by consumers to make purchases at the showrooms and that the Department was losing a considerable amount of legitimate contribution to overhead charges by the policy now in force. Dissatisfaction was frequently expressed by consumers on being told that they must go elsewhere to purchase an article which was before them, and it was doubtful whether any consumer ever took the trouble unless the article in demand was of major importance. The result was that no one benefited. Councillor Bains, vice-chairman of the Electricity Committee, in moving the amendment that the matter be deferred for two years, said it would be unfair to penalise legitimate traders who had to pay rates. Councillor Stewart pointed out that when they considered showrooms there was a definite assurance that they should not enter into municipal trading.

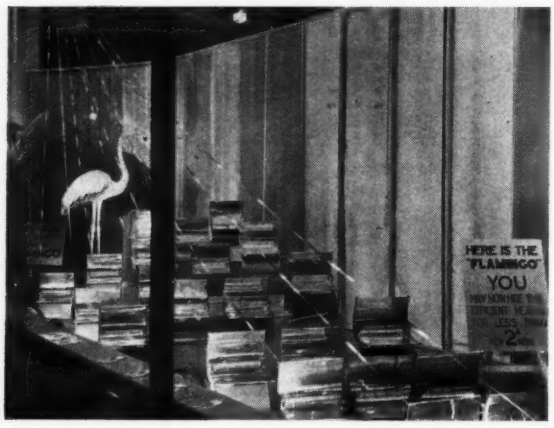
A Proposed Industrial Exhibition in Belfast

The possibility of Belfast staging a big industrial exhibition was referred to by Sir Crawford McCullagh, Bt., Lord Mayor, at a meeting of the Belfast Corporation on November 8th, while referring to the Northern Ireland Government having made a grant in support of the Empire Exhibition in Glasgow, where there will be a Northern Ireland stand at a cost of £6,000, of which sum the Government will pay one-half. As there was a movement in Belfast to celebrate the centenary of the Municipal Corporation Act in 1940 it would

be better to concentrate on that, he thought, than take a Northern Ireland Pavilion at Glasgow next year. The latter would cost £50,000 at least. It is understood that Belfast Corporation is to vote £1,000 for the Northern Ireland stand.

An Electric Fire Display

The accompanying illustration shows a display of electric fires which is now being shown in one of the windows of the showrooms of the Ealing Corporation Electricity Department.



A display of "Flamingo" fires at the showrooms of Ealing Corporation Electricity Department

These are "Flamingo" fires, made by Bratt Colbran, Ltd., which the Department is letting out on hire.

The Paris Exhibition

The Paris correspondent of *The Times* reports that the International Exhibition Bureau has decided to grant the French Government's request for authorisation to reopen the Paris Exhibition in 1938.

Good Lighting in Industry

The fourth lecture of the E.L.M.A. Illumination Design Course was given at the Lighting Service Bureau on November 1st, when Mr. H. Lingard spoke on "The Value of Good Lighting in Industry." He said that the industrialist should plan not only for the present but also for the future. He traced the evolution of industry from the earliest days when man was engaged in providing his immediate necessities. He explained how during centuries of evolution the mechanism of the eye had remained fundamentally the same, and although ideally adapted to its environment in the first place, the conditions imposed by modern industry had to be tempered by very exact illumination practice if the eyes were not to be impaired. When industry moved from daylight to vast and gloomy factories, the workers' eyes underwent a tremendous change in conditions, a change from an average of a thousand foot-candles to very much less than an average of ten. To-day modern illumination practice had made it possible very greatly to alleviate the strain of bad lighting by providing more efficient lamps, cheaper electricity, and equipment of such a nature that the most complicated industrial tasks would each be treated on its merits and beneficial lighting provided for the operatives. He discussed the merits of various modern systems of illumination, and showed a series of lantern slides and experiments to illustrate the points he made. Finally, he dealt with the electric-discharge lamp. He explained that it had been found that the colour was not a disadvantage in many industrial processes, and that the stroboscopic effect, which had caused experts considerable worry in the experimental stages, had proved in actual practice considerably less than had been anticipated.

Prices of Materials

Henry Gardner & Co., Ltd., report, November 10th: Copper bars (best selected), sheet and rod, £73, £7 decrease. English pig lead, £18 5s., £1 decrease. Spelter, £15 10s., 18s. 9d. decrease. English block tin, £188 15s., £13 10s. decrease.

Frederick Smith & Co. report, November 10th: Electrolytic copper bars, £45 10s., £3 10s. decrease. Ditto, ditto, wire rods, £50 10s., £4 decrease. Silicium bronze wire, 8⅛d., ⅞d. decrease. No change in price of electrolytic copper h.c. wire.

Edward Till & Co. report, November 10th: India rubber, Para fine, 7⅞d., ⅛d. decrease.

Social Events

About 250 persons attended a very enjoyable whist drive, dance and social evening held last Saturday by the Bethnal Green Electricity Sports and Social Club at the Town Hall. Future arrangements of the Club include a children's party on December 19th and the annual dinner at Gatti's Restaurant on January 29th.

Store Lighting

The Metropolitan Chain Stores, Bromley, Kent, provide an excellent example of shop frontage illumination. This has been carried out by means of three 150-W and two 100-W

A Bromley store illuminated by "Philora" sodium lamps

"Philora" sodium lamps made by Philips Lamps, Ltd. The architect was Mr. M. Aveyard, of Metropolitan Chain Stores, Ltd.

Electricity and Industry

AT a sitting of the Royal Commission on Geographical Distribution of Industrial Population of Great Britain which was held at the Institution of Civil Engineers, London, on November 5th, Sir John Snell, chairman of the Electricity Commissioners, presented a memorandum dealing with the relation of electricity supply to the location of industry and population. The memorandum stated that public electricity supply had played a small but important part in the present geographical location of the industries and population of Great Britain.

Owing to the recent improvements in the "wholesale" production of electricity and its wide transmission under the direction of the Central Electricity Board, and the further improvements which could be introduced in the retail distribution of electricity, supplies of any magnitude and at economic prices should within a few years be increasingly available throughout the country. Most new industries or existing industries which found it expedient to move would have a more complete freedom of choice of location so far as their requirements of a supply of electricity for power and other purposes were concerned.

Extensive re-location of existing manufacturing industries, and consequently of the population serving them, would be of serious consequence to the electricity supply industry, which represented at the end of 1935-36 a capital expenditure of over £530,000,000, largely consisting of geographical fixed assets. With the national grid and the extensive secondary transmission system based upon it, coupled with the wide geographical distribution of the generating stations serving the system, a considerable re-location of industry could now be effected without a corresponding movement of generating stations. While new cable connections and transforming capacity would be necessary to serve the transferred industries, there were such large potentialities of expansion in the national demand for electricity that it was probable that the greater part of the equipment rendered redundant by such movements would at a later date be required to meet the growth of demand in the old areas.

The memorandum also points out the importance of the public electricity supply industry as a factor of national defence. It states that while the modern power stations provided an increased target during air raids, this was more than counterbalanced by the nationally interconnected system which could restore electricity supply to an important munition centre more rapidly than if such a centre were dependent upon a single isolated station which had been directly hit during an air raid.

As a result of schemes which had been carried out by the Electricity Commissioners to demonstrate the potentialities of intensive electrical development in typical rural and agricultural areas, there was now good ground for the belief that, with a judicious measure of regrouping of urban and rural areas, electricity could be made available at economic rates throughout all but the most remote rural districts.

In reply to a question as to whether a single central authority and a flat rate of charge all over the country would be an advantage, Sir John said that after twelve months' labour on the McGowan Committee, they came to the conclusion that a central distributing authority was not, in the present state of society, a desirable thing to have.

Electrical Commercial Travellers

The Electrical Trades' Commercial Travellers' Association is holding its annual dinner-dance on November 19th (6.30 for 7 p.m.), at the Criterion Restaurant, Piccadilly Circus, W.

New Catalogues and Lists

Adam Hilger, Ltd., 98, King's Road, Camden Road, London, N.W.1.—A technical booklet describing the "Dexrae" industrial X-ray unit.

"Beeantee" Illuminations, Ltd., 88, Goswell Road, London, E.C.1.—Details of interchangeable festoon strip lighting holders.

Saxonia Electrical Wire Co., Ltd., Roan Works, Greenwich, S.E.10.—A pocket list of flexible cables and cords.

Drake & Gorham Wholesale, Ltd., 77, Long Acre, London, W.C.2.—A price list of electrical accessories.

F. W. Lechner & Co., Ltd., 5, Fairfax Road, London, N.W.6.—Details of the "Kabi" precision construction rotary switch.

Thomas & Son (Worcester), Ltd., Climax Works, Worcester.—A 66-page illustrated booklet describing "Climax" pumps.

Foster Engineering Co., Ltd., Apex Works, South Wimbledon, London, S.W.19.—A leaflet describing a low-voltage transformer.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—An 80-page illustrated catalogue of iron-clad switchgear.

Murex Welding Processes, Ltd., Ferry Lane Works, Forest Road, London, E.17.—A technical brochure on "Ironex" electrodes.

Brook Motors, Ltd., Empress Works, Huddersfield.—An abridged price list of a.c. motors and control gear.

Crofts (Engineers), Ltd., Thornbury, Bradford.—Catalogues of geared motors and double reduction worm gears.

Gent & Co., Ltd., Faraday Works, Leicester.—Book 5, Section 7B, dealing with "Tangent" synchronous clocks of the mantel, panel, cinema, outside bracket and tower types.

Electrical Commodities, Ltd., Sparton Works, Beresford Avenue, Wembley.—Details of "Hammond" electric clocks.

Batteries, Ltd., Hunt End Works, Redditch.—A technical manual dealing with emergency lighting with particular reference to the "Nife-Neverfayle." Wiring diagrams of various lay-outs are included.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1.—A leaflet illustrating new reflector fires.

Wholesale Fittings Co., Ltd., 23-27, Commercial Street, London, E.1.—A 112-page illustrated catalogue of all kinds of electrical installation accessories.

Bankruptcy Proceedings

E. A. Cartwright, 8, Heskey Street, Nottingham, lately carrying on business at 71, Melton Road, West Bridgford, Notts, radio dealer.—The public examination was closed on November 4th at the County Court House, Nottingham, when debtor attributed his failure to inexperience of the financial side of the business, lack of capital, and inadequate turnover having regard to the heavy expenses. According to the statement of affairs there was a deficiency amounting to £676.

W. Gallagher, trading under the style of Driver Brothers, 14, Ivegate, Yeadon, Yorks, radio, electrical and cycle dealer.—The public examination herein was resumed recently at the County Court House, Leeds. According to the statement of affairs returned there was a deficiency of £1,452. Debtor attributed his failure to lack of capital, competition and bad debts. The examination was adjourned for formal closing.

Nottingham Crystal Twinlight Co., 11, Bilbie Street, Nottingham, and lately carrying on business at Trinity House, Forman Street, Nottingham, electric lamp dealers.—The first meeting of creditors in this matter was held at the Official Receiver's Office, 22, Regent Street, Park Row, Nottingham, on November 3rd. The failure was attributed to insufficient turnover as the result of inability to obtain repeat orders. The matter was left in the hands of the Official Receiver, as trustee.

M. Morris, radio dealer, Lower Clapton Road, Clapton, late of Canfield Gardens, Kilburn Avenue Mansions, Finchley Road, Hampstead, High Street and Voltaire Road, Clapham.—The first meeting of the creditors was held on November 2nd at Carey Street, London, W.C. The Official Receiver stated that the receiving order was made on the petition of a creditor claiming £318. The debtor was not present and a medical certificate was put in to account for his absence. No details transpired and the case was left in the hands of the Official Receiver as trustee.

E. F. Hunt, "St. Albans," Cherry Chase, Tiptree, Essex, radio and electrical dealer, lately trading with another as "Hunt's Radio Service," Cameron House, High Street, Ingatestone, Essex.—The public examination was held on November 3rd at the Shire Hall, Chelmsford, when the statement of affairs disclosed a deficiency of £402 on liabilities of £418. The debtor had been aware of his position since June, 1936, and he attributed his failure to losses sustained while trading in partnership and the loss of business consequent upon a fire. The examination was adjourned.

J. A. N. B. Tanner, electrical engineer, 3, Jubilee Buildings, Lowestoft.—First meeting November 12th at the Official Receiver's office, Castle Chambers, Opie Street, Norwich. Public examination November 22nd at the Town Hall, Great Yarmouth.

C. G. Smith, electrical contractor, 66, Lichfield Street, Wolverhampton.—Discharged as from November 8th, 1937.

G. A. Wood, electrician, 22, Kimberley Road, Astley Bridge, Bolton, lately trading at 148, Bark Street, Bolton, and 135, Chorley New Road, Horwich.—Last day for receiving proofs for dividend November 20th. Trustee, Mr. P. M. Milward, Byrom Street, Manchester, 1, Official Receiver.

Company Liquidations

East Midland Electrical Co., Ltd.—Winding up voluntarily. Liquidator, Mr. R. Archer, 38, Deangsgate, Manchester.

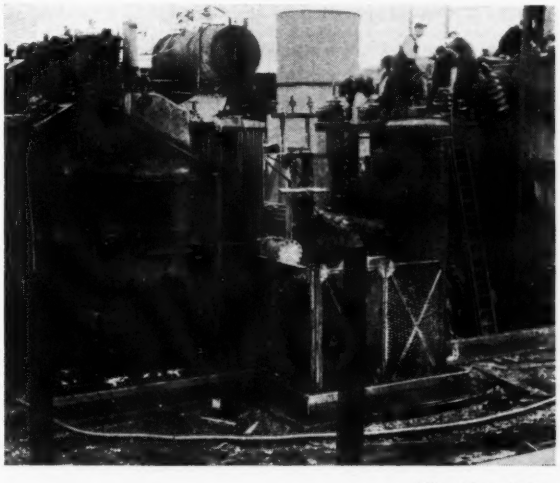
Radio-Gram & Television, Ltd.—Meeting December 7th, at 170, Bishopsgate, E.C.2, to receive an account of the winding-up by the liquidator, Mr. B. T. Jansen.

Electricity Supply

Lighting, Domestic, Power

Aylesbury.—SUPPLY FAILURE.—A four-hour failure of electricity supply affecting Aylesbury and its rural area occurred on November 1st, at 5.10 p.m., when, without warning, a portion of the No. 2 11-kV switchgear of the Central Electricity Board at the works exploded and caught fire. No one was injured and the flames were promptly extinguished by the staff. The Board's engineers were working at the time on No. 1 duplicate feeder, changing over the cable to put into commission a new set of switchgear. They completed this work by 9.10 p.m. and the supply was restored. New switchgear has been specially secured to cope with the emergency and will serve during the winter months until the new major scheme, already in hand, is completed.

Barnstaple.—POWER STATION EXTENSION.—The Corporation's power station extension was opened by the Mayor (Capt. S. W. Slatter) on Wednesday last week. Mr. C. F. Dart, chairman of the Electricity Committee, said that two new 450-kW Diesel sets had been installed. In order to relieve the strain on the d.c. sets it was possible to convert 300 kW from one of the new sets to d.c. Following the opening Mr. J. W. D. Cook, the borough electrical engineer, presented the Mayor with an electric clock.



[*Elec. Rev.* photo.

The fire at East Ham referred to in a leaderette on page 660

Berwick.—CHANGE-OVER.—At a meeting of the Town Council a letter was read from the Scottish Southern Electric Supply Co., Ltd., stating that it intended to change over the system of supply on the north side of the railway to a.c. No arrangements had been made, however, regarding the other parts of the borough. The Council is requesting the company to fix a time limit for the changing over of the whole system in the borough.

Bootle.—ELECTRIC-DISCHARGE LIGHTING.—The Watch Committee is to provide sodium lighting in Marsh Lane at a cost of £250.

Ceylon.—HYDRO-ELECTRIC PROJECT.—A sum of £37,500 has been voted by the State Council for the construction of the Laxapana hydro-electric scheme, the total cost of which is estimated at £1,800,000. The Secretary of State for the Colonies is prepared to support an application for a grant of over £90,000 from the Colonial Development Fund. Tenders are to be called both inside and outside the British Empire, but it is not known whether the grant will be forthcoming if the work is given to a foreign contractor, states *The Times* Colombo correspondent.

Croydon.—UNDERTAKING'S PROGRESS.—The expansion of the distribution system to cope with new housing development and increasing loads continues, states the chief engineer and general manager of the Electricity Department (Mr. F. N. Rendell-Baker) in his report for 1936-37. During the year forty-four miles of cable have been laid and thirteen new sub-stations have been put into commission, increasing the total number to sixty-five extra-high-voltage and 141 high-voltage sub-stations. The first stage in the construction of the 33,000-V north and south ring mains has been completed by the laying of 4¼ miles of 3-core 0.25 sq. in. "H" type cable from the central station to Suffolk Road sub-station. The improved facilities provided for the sale of electrical apparatus are much appreciated by consumers, and considerable advantage has been taken by intending purchasers of the advice offered and of the reasonable hire-purchase terms available. It is now necessary to give two cooking demonstrations per week in order to accommodate the numbers wishing to attend. Lectures by the staff upon the domestic uses of electricity have been given throughout the year to various organisations in the borough, and the sales staff have also interviewed over 46,000 consumers and prospective consumers at the showrooms and at their own

premises. The use of domestic refrigerators continues to expand, and 183 machines were sold for cash or on hire-purchase terms during the year to the value of £5,500. The development of the immersion heater for domestic hot-water supply shows continued progress, and the small 1½-gal. water-heater for the kitchen sink is also popular. The statement of apparatus hired out shows that cookers increased in number by 1,126 to 6,582, water-heaters and wash-coppers by 659 to 4,002, and immersion heaters by 361 to 1,520. Equipment of all types increased from 13,272 to 15,530. Sales of energy increased by 12.7 to 112.5 million kWh and consumers by 3,514 to 54,404. The surplus shown in the accounts amounts to £40,251, which includes a further saving of £15,399 on the cost of electricity purchased from the Central Electricity Board for 1935. A sum of £22,000 has been allocated to rate relief, leaving £18,251 to be transferred to reserve. The result is considered very gratifying when it is borne in mind that during the year reductions in tariffs benefited consumers by approximately £26,000. Notwithstanding these reductions the income from the sale of electricity increased from £480,144 to £500,088.

Cumberland.—BORROWDALE SCHEME.—The proposal of the Mid-Cumberland Electricity Co. to erect overhead lines along Borrowdale Valley has recently been the subject of discussions between representatives of the company and the County Council, which is urging that underground cables should be used from Catbells to a point above Manesty Wood and from Grange Village to Colywife Dub at the south end of the narrow passage of the Derwent, a total of 4,820 yd. At a meeting of the Council last week it was stated that the company was prepared to concur provided assistance was forthcoming towards meeting the extra cost. Mr. Charles Roberts said the figure asked for by the company was, in his view, too high, but he hoped it might be modified. The route had been carefully surveyed and it was found that should the cable be laid underground 63 per cent. of its length could be laid in the grass verge. This would carry with it a corresponding restriction of the depth of the cable.

Durham.—SCHOOL LIGHTING.—The Board of Education has approved the installation of electric lighting in the following schools by the Durham County Education Committee: Blackhill, Greencroft, Murton Colliery and Ryhope Street.

Eston.—FREE KETTLES.—A two-pint electric kettle or a three-pint aluminium kettle is to be issued free of charge to consumers hiring a standard electric cooker.

Finchley.—BUSINESS TARIFFS.—The tariff in respect of supplies of electricity for shop window and display lighting has been reduced and in future will operate from 7 p.m., instead of from 7.30 p.m. An alternative flat rate tariff of 1d. per kWh is offered to consumers of electricity in business premises for separately metered power and heating supplies.

REFRIGERATORS.—The engineer is to investigate and report upon schemes for the hire-purchase of refrigerators.

LOANS.—The Electricity Committee has obtained sanction to borrow £6,000 for wiring installations and £24,000 for consumers' electrical apparatus. It is also seeking sanction to borrow £28,000 for high-voltage and £9,328 for low-voltage mains.

Great Britain.—OUTPUT OF ELECTRICITY.—Authorised undertakings generated 2,029 million kWh in October, an increase of 9 per cent. over the corresponding month of 1936, which contained an extra working day.

Guildford.—LOAN.—The Electricity Committee is seeking sanction to borrow £10,000 for mains and services.

ELECTRIC-DISCHARGE LIGHTING.—The borough electrical engineer is to prepare a scheme for the lighting of part of London Road by means of electric-discharge lamps.

Hastings.—MAINS AND SERVICES.—The Town Council is applying for permission to borrow £40,000 for prospective expenditure on house services and extensions to mains.

Hebden Bridge.—REDUCED LIGHTING CHARGE.—The lighting flat rate has been reduced by ¼d. per kWh.

Hornsey.—BETTER LIGHTING.—The Corporation has obtained sanction to borrow £35,000 for street lighting improvements.

India.—THE GANGES GRID.—It is reported in *The Times* that Sir Harry Haig, Governor of the United Provinces, last week opened two power stations near Meerut, marking the practical completion of the Ganges Canal hydro-electric scheme, which he described as the greatest material contribution to the prosperity of the United Provinces that had been made for many years. The development of the grid project has cost over £2,500,000, and the system comprises roughly 4,000 miles of transmission lines to 1,600 sub-stations scattered over the eight western districts of the United Provinces.

Inverness.—LOWER CHARGES.—A revised scale of charges has been put into force by the Electricity Department. In the burgh the lighting flat rate is reduced by ¼d. to 4¾d. and outside by a similar amount to 5¼d. The "unit" charge under the domestic tariff throughout the area is now ¾d. instead of ¾d.

Ipswich.—SUB-STATIONS.—A site has been obtained for a sub-station in Cliff Lane and another is proposed on the Whitton housing estate.

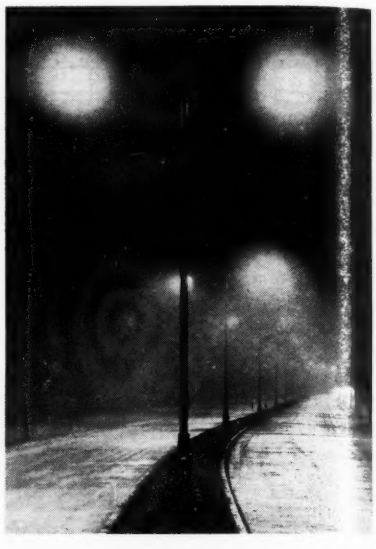
Irish Free State.—KILLARNEY.—The lighting of Killarney, County Kerry, is to be improved and extended by the Electricity Supply Board. The Board proposes to lay high- and low-voltage underground cables in the town.

Lanarkshire.—RURAL SUPPLIES.—The Clyde Valley Electrical Power Co. is to supply electricity to houses and farms on a ten mile stretch of road from Carnwath to Dolphinton by next summer.

Leatherhead.—LIGHTING AT THE BOOKHAMS.—A modified scheme of public lighting is under consideration.

Leeds.—NEW EQUIPMENT.—The Electricity Committee is seeking sanction to borrow £115,000 for a switch house and transformer bays and equipment at Kirkstall power station, £75,000 for sub-station equipment, and £250,000 for mains.

Leicester.—ARTERIAL ROAD LIGHTING.—The lighting installation for the new Loughborough Road and Abbey Lane consists of "Ediswan Northbury" lanterns mounted in pairs on steel poles which are spaced 125 ft. apart and erected on the island in the middle of the road. The lanterns are suspended from brackets overhanging the carriageways and are fitted with 250-W "Royal Ediswan Escura" electric-discharge lamps. The necessary chokes and condensers for the lamps are fitted in special compartments in the bases of the poles. The installation was carried out by the Leicester Corporation Lighting Department under the supervision of Mr. T. Wilkie, the city lighting engineer.



Dual carriageway lighting at Leicester

Lithuania.—NEW POWER STATIONS.—According to a message published by the Lithuanian Telegraph Agency, the Power Commission appointed by the Lithuanian Government has outlined an ambitious electrification scheme to be carried out by a new concern, the Lithuanian Electrification Co., which has a capital of six million lits (51 per cent. subscribed by the State and the rest of municipalities or private persons). First the new company is to erect a steam plant at Rekyva and also two hydro-electric plants at Minija. It is further proposed to erect a large water-power plant near Jonava, although this is not likely to be begun before 1940. The station will be linked with the Rekyva and Minija plants. A subsequent stage of the electrification scheme provides for the erection of another large water-power plant on he River Nemunas.

Mossend.—SUPPLY TO FACTORY.—The Clyde Valley Electrical Power Co., Ltd., has prepared plans for the erection of a sub-station in connection with the new factory to be established on the site of the old Mossend steelworks at Bellshill.

Muirkirk (Ayrshire).—SUPPLY INAUGURATED.—A supply of electricity was switched on last Saturday.

Newcastle-on-Tyne.—OPTION TO PURCHASE UNDERTAKINGS.—The Parliamentary Committee of the City Council has had under consideration the Council's option to purchase the undertakings, within the city boundary, of the North-Eastern Electric Supply Co., Ltd., and the Newcastle & District Electric Lighting Co., Ltd. It has been decided, if the two companies are agreeable, to postpone the Council's option for another two years. The Committee has interviewed the Electricity Commissioners on the matter, who stated that their consent was necessary to the exercise of the Corporation's purchase powers. In view of impending legislation, the Commissioners said, it was difficult to give a decision. They suggested that the matter should be postponed for a time. The Parliamentary Committee agreed to a postponement of two years provided the companies concerned were willing.

Northamptonshire.—PARACHUTE STRIKES OVERHEAD LINES.—A parachute in which an R.A.F. instructor was descending after having to abandon his machine became entangled in the grid overhead lines near Collyweston shortly after midnight on November 4th, with the result that the electricity supply was cut off from a large rural area in North Northants and Rutland. The parachute was burned, but the R.A.F. man had released his hold and fell to the ground practically unhurt.

North-West Midlands.—J.E.A.'s ACCOUNTS.—The 1936-37 accounts of the Authority record an increase in income from bulk supplies of £40,878 to a total of £219,949, partly attributable to increased supplies and partly to higher costs. In quantity, sales of this kind rose from 113.1 to 131.8 million kWh, the average income increasing from 0.38d. to 0.401d.

Most of the output was derived from the Stoke-on-Trent station, which sent out 120.5 million kWh. Here coal was the chief contributory cause of the increase in costs, the average of 14s. 11d. per ton being 2s. more than in the preceding year. Fuel, including the cost of handling, averaged 0.140d. per kWh sent out, against 0.117d. in 1935-36. At this station the coal used per kWh generated (1.607 lb.) was higher than in the previous year (1.535 lb.) owing to the second 12,500-kW set being in commission for longer periods and to the average calorific value of the coal having fallen from 11,740 to 11,320 B.th.u. Repairs and maintenance per kWh sent out rose by 0.002d. to 0.021d., which includes the purchase of an air preheater and fan equipment. Wages were up 0.001d. to 0.016d., and rates were a point less at 0.012d. The distribution supplies of the J.E.A. totalled 11.2, against 7.4 million kWh, with an increase in income from £41,410 to £59,595, these figures excluding meter rents, &c., of £2,698 and £3,229. Per kWh, the income dropped from 1.341d. to 1.281d. Good progress was made in the hire of equipment, the numbers let out at March 31st last being as follows, with the position at March 31st, 1936, in parentheses: 3-pt. electric kettles, 551 (71); irons, 506 (66); rental wiring, 339 (106); ordinary cookers, 236 (51); wash-boilers, 81 (2); and thermal-storage cookers, 40 (45).

Nottinghamshire.—BULK SUPPLY V. PRIVATE GENERATION.—The Minister of Health has asked for a detailed report setting out the relative cost of purchased and privately generated electricity in connection with the proposed scheme for the centralisation of engineering services at the Ransom sanatorium. The report, which was prepared by the consulting engineer, was required to substantiate the recommendation that, owing to lower running costs, electricity at the sanatorium should be generated by private plant and not obtained from the grid system. Specifications and quantities are being prepared.

Scunthorpe.—BETTER LIGHTING.—A scheme for the improvement of street lighting, estimated to cost £2,000, is being considered by the Borough Council.

Sheffield.—MAINS.—The Electricity Committee is to extend mains at a cost of £13,556.

South Shields.—SUB-STATION.—The Electricity Committee is to provide a sub-station at North Marine Park at a cost of £1,200.

X-RAY EQUIPMENT.—The governors of the Ingham Infirmary propose to install X-ray equipment at a cost of £3,000.

South Wales.—CONFERENCE OF LOCAL AUTHORITIES.—South Wales local authorities owning small electricity undertakings held a conference in Cardiff recently as a first step in their fight against being merged with larger concerns, as proposed in the "White Paper." According to the *Financial Times* of Wednesday twenty local authorities have agreed on a scheme for amalgamating their undertakings. They are Cardiff, Aberdare, Bedwellty, Mountain Ash, Pontypridd, Bedwas and Machen, Risca, Tredegar, Rhondda, Abertillery, Mynyddislwyn, Cwmbran, Penybont, Barry, Pontardawe, Ebbw Vale, Maesteg, Caerphilly, and Ogmore and Garw. Under the proposed scheme the consolidated undertaking would buy outright the private undertakings in the area of the amalgamated authority.

A.E.C.-English Electric trolley-buses recently put into service at Adelaide

Torquay.—HIRE-PURCHASE SCHEME.—The Electricity Committee has recommended the adoption of a hire-purchase scheme for apparatus and fittings, and the matter has been referred to a sub-committee.

MAINS AND SERVICES.—Sanction is sought to borrow £30,000 for mains and services.

West Hartlepool.—DOMESTIC ELECTRICAL PROGRESS.—The Council recently approved an assisted-wiring weekly tariff, which 1,600 consumers adopted within the first month from its inception. During that time the output of cookers on hire was unprecedented. A further reduction has been made in the domestic rate, all kWh after the first 130 per quarter being reduced from ¼d. per kWh to three kWh a 1d.

NEW EQUIPMENT.—Tenders have been invited for a 300-kVA transformer, two electric vehicles, and meter-testing equipment.

Weymouth.—CONSUMERS TO BENEFIT.—After reviewing the past year's working of the Electricity Department (net profit, £13,241) the Council has decided to reduce electricity charges by an amount equal to £7,100 in a complete year. Charges throughout the area of supply are to be standardised by the abolition of the additional 25 per cent. which is at present paid by consumers in the area of supply outside the borough.

Wimbledon.—EXTENSIVE USE OF ELECTRICITY.—The Electricity Department's attractive two-part tariff, with a running charge of ¼d. in the summer and ½d. in the winter, seems to have been largely concerned in the production of high figures for residential consumption during 1936-37. According to the annual report of the chief engineer and manager (Mr. A. E. McKenzie), the number of consumers under this tariff increased by 2,642 to 8,399 during the year, their average consumption being 2,898 kWh, and the aggregate represented 35 per cent. of the total sales. The hire department exceeded all previous progress records, the net new appliances connected during 1936-37 and the totals at the end of the period being as follows: Water-heaters, 3,074 (12,485); radiators, 1,983 (10,117); cookers, 1,749 (9,260); kettles, 1,414 (7,685); irons, 1,100 (8,182); and wash-boilers, 485 (2,800). Sales of appliances on hire purchase steadily increased, the total value of those issued at March 31st being £22,012, and there was a profit of £4,005 on the account. Mr. McKenzie states that no other municipal undertaking has published better progress figures than Wimbledon in refrigerator business. At the finish of the past three financial years the numbers installed were 41, 212 and 484. Very few homes in the area are now without electricity—not more than two or three per cent. In other directions there has also been expansion. Altogether, consumers increased in number by 2,834 to 39,405 and sales rose by 15 per cent. to 68.9 million kWh, equivalent to 1,747 kWh per consumer. Despite a further bonus on consumers' accounts for the December quarter equal to 20 per cent., or £19,920, the Department still made a profit of £35,273, against £25,285 in the previous year.

Worksop.—ELECTRICAL EQUIPMENT CONNECTED.—During the last twelve months domestic electrical appliances have been let out on hire to the value of £10,000 reports Mr. M. S. Mason, the borough electrical engineer. In the quarter ended September 30th, 674 appliances were hired out, including 160 cookers and 157 grillers. In addition, four electrode boilers having a total capacity of 860 kW were put into commission, and an order for a further 60-kW boiler for a cinema has recently been received. Four of the boilers mentioned replace either gas or coke, and one is for use in a new building. A 370-kW motor installation was recently started up, making a total of 3,030 kW of equipment coupled up during the September quarter, excluding lighting connections. In considering this figure it should be borne in mind that Worksop is a mining town, with three collieries within the borough.

Traction

Australia.—TROLLEY-BUSES IN ADELAIDE.—A number of A.E.C.-English Electric trolley-buses have recently been put into service by the Adelaide Tramways Trust. These will shortly be supplemented by another ten similar double-deck, four-wheeled vehicles. The chassis were built partly by the A.E.C. at Southall, England, and partly by the A.E.C. Australia (Pty.), Ltd., Sydney, N.S.W.

Brazil.—ELECTRIFICATION OF BRANCH LINE.—The director of the Central of Brazil Railway is studying the possibility of electrifying the Sabará-Santa Barbara branch line. In an interview with the Press, the director stated that the carrying out of such a scheme had become imperative. He pointed out that it is one of the most important lines of the system owing to the fact that it passes through some of the principal industrial centres, and the speedy carrying out of the plan is entirely justified. The stretch in question is 77 km. in length. The director added that the matter is already being discussed with the Government. As soon as the means are forthcoming for putting the scheme into practice he will give instructions for the work to be proceeded with.

Chichester.—RAILWAY SERVICES.—When the electrification of the South Coast line from West Worthing to Arundel, Chichester and Havant is completed next July there will be a considerable improvement in railway services, stated Mr. C. Grasemann, public relations officer of the Southern Railway Co., at a recent Chamber of Commerce meeting. He said that whereas now Chichester had a weekday service from London of fifteen trains a day (ten through trains), averaging 2 hr. 7 min., under the proposed electric service there would be seventeen trains (fifteen through), averaging 1 hr. 43 min. On the up line there were eighteen weekday trains (eight through), averaging 2 hr. 11 min., which under the new conditions would be increased to twenty trains (fourteen through), averaging 1 hr. 50 min. He referred to the increases in

passengers and revenue which had followed the electrification of other parts of the system. One month's figures for the electrified Portsmouth-London line, he said, showed an increase of 24 per cent., equivalent to 66,000 passengers.

France.—LIGHTING ON THE PARIS UNDERGROUND.—Advantage is being taken of the change-over from d.c. to a.c. of the lighting system on the Underground Railway in Paris to adopt improved methods. The new installations are composed of from fourteen to seventeen lamps on the ordinary 250-ft. platforms and twenty-four lamps on the 350-ft. platforms. In two stations that have been re-equipped a combination of argon-mercury-discharge lamps with neon tubes is used, giving a nearly white light. In order to introduce variety between stations five different types of globes are installed and blue discharge tubes are employed at Champs Elysées Clemenceau instead of the usual chrome suspending rods. Adjacent lamps are connected to different outers of a three-phase network. The old d.c. system has been left as stand-by, the filament lamps being suspended by cords or fixed in sockets in the roof of the station; having no globes, they are inconspicuous when not alight. New 3-kV feeders have been run from the railway sub-stations, where the voltage is stepped down from 10 kV, to each station in which further transformation is effected to 220-115 V on a three-phase, four-wire system. There are two low-voltage switchboards. One controls two a.c. circuits (one for each platform) by means of 25-A, 250-V four-pole breakers, which, on opening, energise a relay to close a breaker on the second switchboard, which brings the corresponding d.c. circuit into service.

New lighting fittings in the Champs Elysées Clemenceau station of the Paris Underground Railway. Blue discharge tubes are employed as suspension rods

London.—NINE-CAR "TUBE" TRAINS.—Tests started this week on the Northern Line with nine-car "Tube" trains capable of accommodating more than 1,000 passengers. The last two carriages of a train travelling from Edgware southward were reserved for passengers to Tottenham Court Road, and remained in the tunnel at intermediate underground stations. The platforms of stations north of Hampstead to Colindale, which are above ground, have been lengthened.

Russia.—NEW SUBWAY LINE.—A *Reuter* message from Moscow states that the first trial train was run last week on the newly built two-mile Moscow subway line.

Sweden.—RAILWAY ELECTRIFICATION.—At the end of the past financial year of the Swedish State Railways 1,780 route miles of line, or 39 per cent. of the total, were electrified on the 16-kV single-phase system and handled 58 per cent. of the total train-miles and 75 per cent. of the ton-miles. This traffic was hauled by 384 electric locomotives. There are 220 miles of privately owned electric railways, and a further 160 miles are being converted. The most important of those being electrified is the line from Göteborg to the Norwegian frontier at Körnsjo, scheduled for completion in 1939. The other lines are in the neighbourhood of Stockholm. In addition the Nordmark-Klaralven Railway, which has had a 100-mile electrified section since 1921, is now building its own generating plant, and when this is ready the 16-kV single-phase supply will be changed from the present 25 cycles to 16.6 cycles.

Communications

Australia.—RADIO CONVENTION.—The World Radio Convention to be held at Sydney in association with Australia's 150th anniversary celebrations next year will cover all phases of radio engineering. According to a *Reuter* message from Sydney, the Minister in charge of the celebrations (Mr. Dunningham) has stated that possibly Mr. David Sarnoff, president of the Radio Corporation of America, will come to the Convention with Guilio Marconi, twenty-six-year-old son of the late Marchese Marconi, who is studying in America. It is also expected that Professor Van der Pol, a noted scientist from Holland, and other prominent world engineers will attend.

Burma.—BROADCASTING.—A *Reuter* message from Rangoon states that a proposal is under consideration for a Government broadcasting station for Burma, to be situated in Rangoon. At present there is a Government experimental station.

Tristan da Cunha.—RADIO STATION.—The Colonial Secretary (Mr. Ormsby Gore) has given permission for the setting up of a radio transmitting station on Tristan da Cunha, the "world's loneliest island," states *Reuter*. The authorisation has been granted to Dr. Erling Christophersen, the leader of the Norwegian expedition which is leaving Capetown for Tristan da Cunha this month.

Forthcoming Events

Institution of Electrical Engineers.—Thursday, November 18th. Institution, London, W.C.2. 6 p.m. Joint meeting with the British Section of the Société des Ingénieurs Civils de France. "Electrification of the Paris-Orléans and Midi Railways." Mr. A. Bachellery.

Mersey and North Wales (Liverpool) Centre.—Monday, November 15th. The University, Liverpool. 7 p.m. Paper by Mr. A. Bachellery.

South Midland Centre.—Monday, November 15th. James Watt Memorial Institute, Birmingham. 7 p.m. "Street Traffic Signals." Mr. F. G. Tyack.

East Midland Sub-Centre.—Tuesday, November 16th. The College, Loughborough. 6.45 p.m. "The Development of Man's Achievement—A Retrospective and Futurist Review of Our Industry." Mr. H. Hooper.

Irish Centre.—Tuesday, November 16th. Mansion House, Dublin. 8 p.m. Faraday Lecture. "The Evolution of Electrical Power." Dr. A. P. M. Fleming.

Northern Ireland Sub-Centre.—Tuesday, November 16th. 9, Wellington Place, Belfast. 6.30 p.m. "Fire Precautions in Major Electrical Stations." Mr. F. C. Winfield.

North Western Centre.—Tuesday, November 16th. Engineers' Club, Manchester. 7.15 p.m. "Rural Electrification." Mr. J. S. Pickles.

Sheffield Sub-Centre.—Wednesday, November 17th. Royal Victoria Hotel, Sheffield. 7.30 p.m. "Transformer On-Load Tap-Changing Gear." Mr. H. Diggle.

Transmission Section.—Wednesday, November 17th. Institution, London, W.C.2. 6 p.m. Inaugural address by Mr. J. L. Eve, chairman.

Meter and Instrument Section.—Friday, November 19th. Holborn Restaurant, London, W.C.1. 6.45 for 7 p.m. Annual dinner.

Electrical Engineers' Dance.—Friday, November 12th. Grand Hotel, Harrogate.

Institution of Mechanical Engineers.—Friday, November 12th. Institution, London, S.W.1. 6.30 p.m. Informal meeting. "Fabrication by Arc Welding." Mr. R. M. Gooderham.

Midland Electrical Engineers' Ball.—Friday, November 12th. Grand Hotel, Birmingham.

Association of Mining Electrical Engineers (*South Wales Branch*).—Saturday, November 13th. South Wales Institute of Engineers, Cardiff. 6. p.m. "Automatic Telephony." Mr. J. C. George. Saturday, November 20th. 3 p.m. Visit to the Cardiff Engineering Exhibition.

Public Works, Roads and Transport Congress and Exhibition.—Monday, November 15th, to Saturday, November 20th. Royal Agricultural Hall, London, N. Tuesday, November 16th. 11 a.m. Conference under the auspices of the Association of Public Lighting Engineers.

Association of Supervising Electrical Engineers.—Tuesday, November 16th. Lighting Service Bureau, London, W.C.2. 7 p.m. "Lighting for Special Industrial Processes." Messrs. S. Anderson and W. R. Stevens. Tuesday, November 16th. Grosvenor Hotel, Manchester. 7.30 p.m. Informal lecture. "Transformers." Mr. W. L. England. Friday, November 19th. Grosvenor Hotel, Manchester. 7.30 p.m. "Hot-pot" supper. Thursday, November 18th. Cottage Restaurant, Newcastle-upon-Tyne. 7.15 p.m. "Compulsory Wiring Regulations and Registration." Mr. J. M. Crowdy.

Electrical Power Engineers' Association (*London Technical Group*).—Tuesday, November 16th. Caxton Hall, London, S.W.1. 7.15 p.m. "Modern Transformer Construction." Mr. R. M. Charley.

Illuminating Engineering Society.—Tuesday, November 16th. Lighting Service Bureau, London, W.C.2. 7 p.m. Joint meeting with the A.S.E.E. (See above.)

Institution of Electronics.—Tuesday, November 16th. 75, Gloucester Place, London, W.1. 7.30 p.m. "Photons and Electrons." Mr. J. J. Denton.

Cardiff Engineering Exhibition.—Wednesday, November 17th. to Saturday, November 27th. Greyfriars Hall, Cardiff.

Leeds Electrical Club.—Wednesday, November 17th. Victory Hotel, Leeds. Annual dinner and dance.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Aberdeen.—November 16th. County Council. Electrical work at two blocks of houses at Cults. A. J. Morrison, architect, 245, Union Street.

Ardrossan (AYRSHIRE).—November 19th. Town Council. Electric lighting of 100 houses. Joint town clerks, Burgh Chambers (deposit £1 1s.).

Australia.—MELBOURNE.—December 14th. State Electricity Commission of Victoria. 22,000-V, compound-filled, unit-type switchgear and accessories. (T.Y. 27686/37.)*

December 7th. Instrument transformers. (T. 27958/37.)* Five three-phase, totally enclosed, oil-immersed, self-cooled reactors. (T.Y. 27849/37.)*

Berwickshire.—November 15th. County Council. Electrical work at the Gordon, Chirnside and Greenlaw housing estates. Walter Duns, architects, Langtongate, Duns (deposit £1 1s.).

Bootle.—November 23rd. Watch Committee. Street lighting. (November 5th.)

Bradford.—November 18th. Corporation. Two 7½-ton electrically operated travelling cranes. (November 5th.)

Breconshire.—November 18th. County Council. Electric lighting and heating installation at proposed new senior school, Senybridge. H. C. W. Strickland, county architect, Watton Offices, Brecon.

Cardiff.—November 18th. City Council. One 11-panel and one 4-panel 6.6-kV switchboards. (November 5th.)

Cleethorpes.—November 15th. Corporation. Three double-deck trolley-buses, with accommodation for fifty-six passengers each. Engineer and manager, Corporation Transport Offices, Pelham Road.

Colwyn Bay.—November 23rd. Electricity Department. E.h.v. and l.v. cables and sub-station equipment. (November 5th.)

Dumfries.—November 22nd. County Council. Electrical heating apparatus at the Greenknowe section of the Annan Academy. County clerk, County Buildings.

Essex.—November 26th. General Purposes Committee. Electrical installation at the County Hall, Chelmsford, extensions. (November 5th.)

Galashiels.—Town Council. Electrical work at forty-two houses at Forest Gardens. J. and J. Hall, architects.

Glasgow.—November 16th. Corporation. Electric lighting installation at Woodilee nurses' home extensions. Office of Public Works, City Chambers (Room 81), (deposit £2 2s.).

Great Yarmouth.—December 6th. Borough Council. Switchgear. (November 5th.)

Holmfirth (YORKSHIRE).—November 29th. U.D.C. Electrically driven booster pumping set, in duplicate, for 6,000-gal. per hr., against a head of 115 to 185 ft., with all switchgear and accessories. S. G. Dilmot, clerk, Council Offices (deposit £3).

Hornsey.—November 16th. Borough Council. One motor-driven mobile tower wagon. (November 5th.)

India.—Bombay, Baroda and Central India Railway Co. November 17th. Electric lamps. (November 5th.)

Inverlochy (FORT WILLIAM).—November 29th. Inverlochy Society, Ltd. Electrical work in connection with 150 houses. Resident architect, Estate Office, Inverlochy Village (deposit £1 1s.).

Kingston-upon-Thames.—November 15th. Corporation. Street lighting equipment. (October 29th.)

Llandudno.—November 20th. U.D.C. Pumping plant, consisting of multi-stage centrifugal type pumps and electrical machinery for two pumping stations. Engineer, Town Hall.

London.—ST. MARYLEBONE.—November 23rd. Borough Council. Transformers and switchgear. (See this issue.)

Manchester.—November 25th. Electricity Committee. Twelve months' supply of electric water heaters. (See this issue.)

Middlesex.—December 2nd. County Council. Electrical installation at elementary school. (November 5th.)

New Zealand.—WELLINGTON.—December 1st. Stores Control Board. Two steam engine- or turbine-driven alternators, switchgear, electric motors and one motor-driven centrifugal pump. (T.Y. 20412/37.)*

December 7th. Public Works Department. Galvanised steel wire cable. (T. 20931/37.)*

November 23rd. 110-kV air-break switches, with fuses, blades and contacts. (T.Y. 20930/37.)*

January 11th. Ten sets of outdoor-type enclosed switchgear. (T.Y. 27781/37.)*

January 25th. 500 galvanised steel transmission line towers, in connection with the Arapuni electricity scheme. (T.Y. 20857/37.)*

CHRISTCHURCH.—December 7th. Electricity Department. Two three-phase automatic voltage regulators. (T.Y. 20936/37.)*

Nottinghamshire.—November 15th. County Council. Electrical work at a mental colony to be erected at Balderton, Newark. (October 29th.)

Portsmouth.—November 16th. Electricity Undertaking. E.h.v. and l.v. cables, with the necessary cable racks, &c., for the generating station, Gunwharf Road. (November 5th.)

Reigate.—November 22nd. Borough Council. One 11-kV, three-phase, e.h.v. switchboard and two 300-kVA transformers. (November 5th.)

Rowley Regis.—November 18th. Corporation. Electric wiring at 200 houses on the Codsall estate and twenty-six on the Waggon Street estate. (November 5th.)

Sleaford.—November 29th. U.D.C. Electricity Department. Twelve months' supply of l.v. p.i. cables and a.c. and d.c. meters (See this issue.)

South Africa.—CAPE TOWN.—November 24th. Electricity Department. Electric lighting poles, c.i. pole bases and overhead line material. (T.Y. 20633/37.)* Cables. (T.Y. 27539/37.)* (T.Y. 27790/37.)*

DURBAN.—December 3rd. City Electrical Engineer's Department. 6,600-V switchgear. (T.Y. 27533/37.)*

JOHANNESBURG.—December 11th. Electricity Department. H.v. circuit-breakers, with instruments and transformers, relays, control panels, &c. (T.Y. 27733/37.)*

November 20th. City Council. One thirteen-unit, metal-clad, l.v., a.c. switchboard. (T.Y. 27738/37.)*

BRITSTOWN.—November 29th. Municipality. Plant, equipment and materials required for inaugurating an electricity supply undertaking (T. 27792/37.)*

PRETORIA.—December 9th. Public Works Department. Electrically driven laundry machinery. (T.Y. 27797/37.)*

Southend-on-Sea.—November 22nd. Borough Council. Pumping plant at three stations, comprising nine electrically driven sewage pumps, with discharging capacities from 400 gal. to 3,500 gal. per min., motors, switchgear, piping, &c. J. D. & D. M. Watson, 3, Central Buildings, Westminster, London, S.W.1 (deposit £3 3s.).

Stockport.—November 22nd. Electricity Committee. One 5-cwt. electric van. (See this issue.)

Sutherland.—November 16th. County Council. Electrical work at thirty-two houses at Brora. E. W. Brannen, architect, Public Health Office, Dornoch.

Swansea.—November 29th. Borough Council. Meter testing equipment. (October 29th.) 33,000-V oil-filled and compound-filled switch units. (November 5th.)

Uruguay.—MONTEVIDEO.—November 24th. State Electricity Supply and Telephones Administration. H.v. armoured cable. (T.Y. 27632/37.)*

December 14th. H. and l.v. armoured cables. (T.Y. 27630/37.)*

December 20th. Electrical materials, including insulators, cut-outs, fuses, switches, lampholders, &c. (T.Y. 27631/37.)*

Walton and Weybridge.—November 18th. U.D.C. Electricity Department. Cable. (See this issue.)

West Ham.—November 29th. Borough Council. Twelve months' supply of p.i. cables. (November 5th.)

West Hartlepool.—November 18th. Borough Council. Meter testing equipment. (November 5th.)

November 20th. Two 5/7 cwt. electric vehicles. (November 5th.)

West Midlands. — November 30th. Joint Electricity Authority. Transformers, and 33,000-V interconnecting mains. (November 5th.)

West Riding.—November 29th. County Council. Electric lighting at Batley Boys' Grammar school, Mexborough Secondary School, Mirfield Grammar school, Rawmarsh Senior Council school and Wombwell Senior Council school. Education officer, County Hall, Wakefield.

Weymouth and Melcombe Regis.—November 22nd. Electricity Department. Meter test room equipment. (November 5th.)

Wick.—November 27th. Town Council. Electric lighting at sixty houses. Burgh surveyor (deposit £2 2s.).

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* Further particulars from the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, London, S.W.1.

Contracts Closed

Douglas (I.o.M.).—Electricity Committee. Recommended. Cooling tower (£3,434).—Peter Brotherhood, Ltd. Pumps (£921).—Richardsons Westgarth-Brown Boveri, Ltd.

Eston.—Electricity Committee. Accepted. Cable (£539).—Henley's.

Lancashire.—Health Committee. Recommended. Electrical services at Park Hospital, Davyhulme (£2,846).—Broughton & Irlam Electrical Engineering Co.

London.—L.C.C. Housing and Public Health Committee. Electric lighting, &c., in about 787 existing houses and flats at Downham (Lewisham area—No. 5 contract):

	£
Holliday and Son (Electrical). Accepted	**5,940**
Newman and Watson	6,015
F. H. Wheeler and Co.	6,460
Pinching and Walton	6,490
Buchanan and Curwen	6,494
Pemberton and Sturgess (Great Britain)...	6,532
Electrical Installations, Ltd. ...	6,583
Archibald Meckhonik	6,683
G. E. Taylor and Co.	6,714
Read and Partners	6,751
Samuel Reed and Sons	6,834
City Electrical Co.	7,063
South Metropolitan Electric Light and Power Co.	7,085
Springvale Electrical Co. ...	9,533

The chief engineer's comparable estimate is £6,466.

Public Assistance Committee. Accepted. Two electric lifts at the Chelsea Institution (£1,459).—Glasgow Engineers, Ltd.

Norton.—R.D.C. Housing Committee. Wiring ninety Council houses:

	£
Newman and Watson. Accepted...	**468**
F. Greathead	533
C. H. Williams & Co.	571
G. R. Yates	580
E. S. Raney	600
J. G. Appleyard	613
G. B. M. Dean	811
Walker & Hutton	953

Oldbury.—Education Committee. Accepted. Electrical installations in sixty-eight houses on the Holt Farm estate (£338). —Electromobile Engineering Co. (West Bromwich). (In lieu of withdrawn tender.)

Sheffield.—Health Committee. Accepted. Electrical installation at Firth Park Clinic (£498) and at City Hospital Maternity block (£650).—T. B. & W. Cockayne.

Electricity Committee. Accepted. Two transformers (£12,060). —C. A. Parsons & Co. Switchgear (£2,880).—Crompton Parkinson. Ash-handling plant at Blackburn Meadows power station (£29,078).—Mitchell Engineering, Ltd. Neutral earthing switchgear (£2,898).—A. Reyrolle & Co.

Surrey.—County Council. Accepted. Lift installations at the County Hospital, Dorking (£835).—Marryat & Scott.

Notes

The E.I.B.A.

Mr. H. Senior Fothergill, the secretary of the Electrical Industries Benevolent Association, asks us to remind readers that the date of the E.I.B.A. Ball at Grosvenor House (November 23rd) is rapidly approaching. The event promises to be a great success, and the cause for which it is held is important to the industry and is extremely worthy. The Association hopes to sell out tickets before very long so that early application for these (25s. each) is advisable.

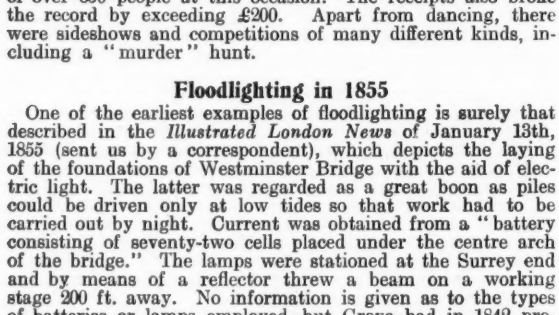
On October 23rd the Birmingham District Branch Centre of the E.I.B.A. held its seventh annual dance at the Magnet Club, Witton, Birmingham. This dance is becoming more popular each year as is evidenced by the record attendance of over 650 people at this occasion. The receipts also broke the record by exceeding £200. Apart from dancing, there were sideshows and competitions of many different kinds, including a "murder" hunt.

Floodlighting in 1855

One of the earliest examples of floodlighting is surely that described in the *Illustrated London News* of January 13th, 1855 (sent us by a correspondent), which depicts the laying of the foundations of Westminster Bridge with the aid of electric light. The latter was regarded as a great boon as piles could be driven only at low tides so that work had to be carried out by night. Current was obtained from a "battery consisting of seventy-two cells placed under the centre arch of the bridge." The lamps were stationed at the Surrey end and by means of a reflector threw a beam on a working stage 200 ft. away. No information is given as to the types of batteries or lamps employed, but Grove had in 1842 produced his cells that had been used experimentally to light arc lamps, of which at least eleven makes were in existence before 1855. Probably, however, the batteries available would not last very long. Haydn's *Dictionary of Dates* refers to the use of "Watson's Electric Light" for illuminating the new Westminster Bridge in 1888.

The Boulder Dam-Los Angeles Line

In our issue of November 20th, 1936, Mrs. V. Ripley, B.Sc., gave some brief details of the transmission line which has been erected to convey power generated at Boulder Dam to the city of Los Angeles 270 miles away. Mrs. Ripley has now



Section of the Boulder Dam-Los Angeles transmission line

sent us a sample of the line which is illustrated herewith. It is of hollow copper 1.4 in. outside diameter. As the drawing shows, it is composed of ten segmental bars tongued and grooved to form a cylinder with a ribbed interior. The segments rely on mechanical grip only and the segments are easily tapped out of the sample section.

I.E.E. (South Midland Centre)

The annual dinner of the South Midland Centre of the Institution of Electrical Engineers will be held at the Grand Hotel, Birmingham, on Friday, November 26th. The reception is at 6.30 p.m., and the dinner at 7 p.m. will be followed by a reunion. Applications for tickets (12s. 6d. each) should be made to Mr. R. H. Rawll, hon. secretary, 65, New Street, Birmingham.

A Factory Lighting Committee

A committee has been appointed by the Home Secretary to review the recommendations made by the Departmental Committee on Lighting in Factories and Workshops in its reports of 1915, 1921 and 1922, in the light of existing knowledge and practice. The aim is to secure adequate and appropriate lighting in factories and workshops generally and for particular processes, and the Committee is asked to advise regarding standards of lighting to be prescribed by regulations under Section 5 (2) of the new Factories Act. The chairman is Mr. D. R. Wilson, Chief Inspector of Factories, and among the members are Dr. J. W. T. Walsh (N.P.L.) and Mr. J. S. Dow (secretary of the Illuminating Engineering Society.

Very Low Temperatures

Last year a concise survey of the physical principles underlying the attainment of very low temperatures was published in connection with the exhibition then held at the Science Museum, South Kensington (Stationery Office, 6d.) This book, which among a great deal of useful data included a chart showing the boiling, freezing and critical points of oxygen, nitrogen, helium and other gases, was the first of three small books, written or edited by T. C. Crawhall, that are designed to cover the entire field of this comparatively new branch of science. The other two are now available at 2s. and 1s. 3d. The second volume, in which the author has been assisted by Dr. O. Kantorowicz, contains details of experiments and demonstration apparatus (with excellent illustrations) and should thus appeal to research workers and teachers. The third volume is a reprint of seven lectures by well-known authorities, three of which relate to industrial uses of low temperatures.

Switch Boxes in Mines

In a memorandum by the Electrical Inspector of Mines (M.D. Circ. No. 100) it is stated that the explosion at Markham Colliery, Derbyshire, last January, in which nine lives were lost, originated in the switch-box of a coal cutting machine. The cover-plate was imperfectly closed due to dirt entrapped probably when the cover was replaced, between the plate and the surface of the flange to which it was bolted. Tests at the Mines Department Testing Station, Buxton, proved that the flame of firedamp ignited inside the switch-box could pass through the $\frac{3}{16}$-in. gap and ignite firedamp in the surrounding atmosphere. In order to avoid projecting edges the cover-plate of the switch-box is usually sunk flush with the sides of the machine, and it may be impossible to ascertain, either by feeler gauge or direct inspection, whether the cover-plate is everywhere close against its seating. Devices to enable the closeness of the fit to be observed directly without a feeler gauge, are illustrated in the memoradum. Manufacturers of coal cutting machines employing flush switch-box doors of the types illustrated will apply suitable devices to all new machines, but similar modifications should be made in machines that are already in use in all mines where safety lamps are used at the coal face. In selecting and applying the device the structural requirements for flameproof enclosure must not be departed from.

Fatality

A verdict of "Accidental death caused by electrocution due to faulty insulation" was returned at the inquest at Corby, Northants, on October 27th, on Phyllip Patrick Curran, aged twenty-one. The works manager of Tarmac, Ltd., expressed the opinion that the insulation of a cable had become damaged by small pieces of slag falling on it. The damage to the insulation had been obscured by the slag dust, otherwise it would have been attended to by the electrician. It was stated that Curran was working throughout the night, and shortly after midnight when cleaning stationary plant he went towards the back of an elevator and apparently took hold of an electric cable. He was holding this with his right hand when his shout attracted the attention of fellow workmen, who released him.

Appointments Vacant

Engineer and manager for Shipley U.D.C. Electricity Department.

Mechanical or electrical engineers for the R.A.O.C.

Senior mains engineer and trainee for Sheffield Electricity Department.

Assistant master in electrical engineering at Cambourne Technical School.

Sales and showroom manager for Brentford and Chiswick Electricity Department.

(See our Classified Advertisements.)

Our Service Department

EVERY day inquiries of all kinds are received by the Editors, the bulk of them relating to the producers of specified classes of electrical goods. We are able to reply to most of these with the aid of our extensive records, but in a few cases we have to seek the assistance of our readers. This week we have been asked for the names and addresses of manufacturers of the following:—

VIACO resistances for meter calibration.

OTTEST heater.

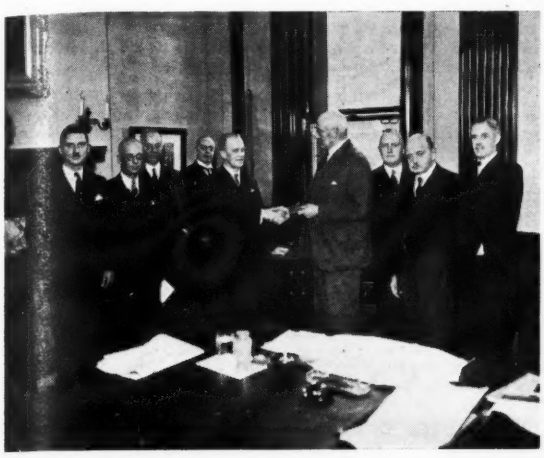
METLEX wall plugs.

Readers should enclose stamped addressed envelopes when making their inquiries.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

A tribute to **Mr. F. J. Bettley,** transport manager and registrar of W. T. Henley's Telegraph Works Co., Ltd., was paid on November 5th when Sir Montague Hughman presented him with a Chippendale period eighteenth-century mahogany bureau writing desk and a gold cigarette case. Mr. A. H. M. Jacob said that although Mr. Bettley had been in the company's service for forty years the presentation was not for that. It was a mark of the regard everyone had for him, both in business and in social life. In making the presentation, Sir Montague referred to the time when Mr. Bettley joined Henley's and there were only twenty members of the staff. Mr. W. F. Bishop also paid tribute to Mr.



The presentation to Mr. F. J. Bettley, of W. T. Henley's Telegraph Works Co., Ltd., showing (left to right), Mr. C. Murfin, Mr. A. H. M. Jacob, Sir Maurice Simpson, Mr. W. F. Bishop, Mr. Bettley, Sir Montague Hughman, Mr. W. McClelland, Mr. J. Lamont and Dr. P. Dunsheath

Bettley's work. In reply, Mr. Bettley said that of the twenty members of the staff when he joined the company two still remained—Mr. Bishop and their manager in Australia, Mr. H. C. Norman.

Dr. L. B. Hunt, M.Sc., A.M.I.A.E., for the past two and a half years editor of *The Metal Industry*, has resigned to take up an appointment as technical manager of Mallory Metallurgical Products, Ltd. This company has recently erected a plant at Croydon, and will produce and market in this country and in Europe the range of hard high-conductivity alloys developed by P. R. Mallory & Co., Inc., Indianapolis.

Mr. A. R. Miller, who has recently resigned his position with Crompton Parkinson, Ltd., has now been appointed manager of the new branch which the Foster Engineering Co., Ltd., has opened at Nottingham.

Sir Alexander Roger (chairman) presenting a medal for fifty years' service, together with £50, to Mr. T. Harding, of British Insulated Cables, Ltd. Mr. G. H. Nisbett (managing director) is on the right and others present are members of the B.I. staff who have been presented with medals for twenty, thirty or forty years' service

Mr. E. A. Baldwin, vice-president and general European manager of the International General Electric Co., has been awarded the decoration of Officer of the Legion of Honour in recognition of his many services to France. Mr. Baldwin is president of the American Chamber of Commerce in France and a director of several European electrical manufacturing companies.

Mr. R. B. Whittick, A.M.I.E.E., has commenced in business at Victoria House, Southampton Row, W.C., as London agent for G. P. Dennis, of Hooton Park, Wirral, and G. Carter & Son, of Romford. Mr. Whittick served his apprenticeship with the British Westinghouse Electric Manufacturing Co., Trafford Park, and has recently resigned his position as rubber cable sales manager of Crompton Parkinson, Ltd., with whom he was employed from 1924, having occupied the position of manager in Canada and in South America. He has been on the local committee of the I.E.E. in Buenos Aires.

Mr. R. B. Whittick

Mr. R. G. Widgery

Mr. R. G. Widgery, electrical engineer and manager of the Shipley Urban District Council's electricity undertaking, has been appointed borough electrical engineer at Dover in succession to **Mr. R. C. Harper,** whose retirement from that position we recently announced. Mr. Widgery was educated at Grays and the East Ham and Battersea Polytechnics, receiving his practical training with the Grays U.D.C. Electricity Department and Taunton Corporation Electricity Department. He went to Maidstone as junior engineer, and later joined the Kingston-on-Thames Electricity Department, where he subsequently became deputy electrical engineer. Mr. Widgery left Kingston to take up the appointment of electrical engineer at Shipley in 1935. He is an associate of the I.E.E. and a member of the American I.E.E.

With reference to the description of the electrical equipment of the Odeon Cinema, which appeared in our last issue, we incorrectly stated that the consultant for the stage work was Mr. J. H. Asdaile. **Mr. J. H. Asdell,** consulting and advisory electrical engineer, of Birmingham, was responsible as consultant for this work.

Lt.-Col. Kenelm Edgcumbe, past-president of the I.E.E., by the recent death of his father, Mr. Richard Edgcumbe, becomes heir-presumptive to the Earl of Mount Edgcumbe.

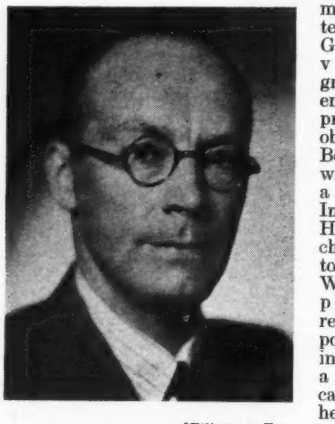
Mr. R. Betty, chief mains foreman of the Bristol Corporation Electricity Department, has retired after serving the Department for thirty-eight years.

Mr. S. Campbell has recently been appointed to the staff of British Timken, Ltd. After spending a training period in England and America he will return home to act as resident service engineer for the company in Australia and New Zealand.

Mr. T. Whitehouse, assistant mains engineer with the Eastbourne Corporation Electricity Department, has been appointed mains engineer with the Mansfield Corporation electricity undertaking. Before going to Eastbourne Mr. Whitehouse was technical assistant at Wolverhampton.

Mr. T. W. Todd, assistant manager at the Wallsend power station of the North-Eastern Electric Supply Co., Ltd., has been appointed manager in succession to **Mr. M. A. Tidmarch,** who has retired.

Mr. J. S. Hastie, B.Sc.(Eng.), A.M.I.E.E., has been appointed technical manager to Scottish Cables, Ltd., Renfrew. He is a Glasgow man and received his technical education at Glasgow University, where he graduated in electrical engineering in 1926. His practical training was obtained with Fraser and Borthwick, Ltd., Glasgow, with whom he served his apprenticeship. In November, 1928, Mr. Hastie was appointed chief technical assistant to the Enfield Cable Works, Ltd., in which position he was responsible for some important development work in connection with 66-kV and 132-kV pressure cables. In August, 1933, he took up an appointment with Johnson and Phillips, Ltd., as head of the Cable Test and Research Department, and three years later he was appointed manager of the Condenser Department in addition to his other duties. Mr. Hastie recently resigned from Johnson and Phillips, Ltd., in order to accept the post with the new company.



[Elliott & Fry.
Mr. J. S. Hastie

Darlington Town Council has decided to grant a pension of £773 per annum to **Mr. J. R. P. Lunn,** who recently retired from the post of borough electrical engineer and transport manager.

Obituary

Mr. C. W. S. Crawley.—We regret to record the death of Mr. Charles William Scott Crawley, M.I.E.E., which occurred on November 9th at the Corner House, Charlbury, Oxon. Mr. Crawley, who was 79 years of age, was one of the very early partners in the business of Nalder Bros., the well-known electrical instrument manufacturers—now Nalder Bros. and Thompson, Ltd.—which was founded in 1884. He joined the late Mr. Francis H. Nalder and his brother, Mr. H. Nalder, two years after the commencement of the enterprise. Mr. Crawley became an associate of the I.E.E. in 1883 and a member in 1898. The funeral service takes place today at Charlbury Parish Church at 10.30 a.m.

Monsieur Omer de Bast.—The death occurred on October 20th of Monsieur Omer de Bast, president of the Association des Ingenieurs Electriciens, Liége.

Mr. Frederick William Tester, who had been employed at the electricity works of Brighton Corporation for thirty-one years, died recently at the age of fifty-one, after a long illness.

Wills.—Mr. G. E. Henderson, chairman of the Tyneside Tramways and Tramroads Co., left £1,327,413, with net personalty £1,295,225.

Sir W. Francis Fladgate, chairman of the London Power Co. and of the Charing Cross Electricity Supply Co., left £13,714 (net personalty £3,829).

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Britannia Electric Lamp Works, Ltd.—Public company. Registered October 29th. Nominal capital, £200,000. Objects: To adopt an agreement with B.E.L. (Assignors), Ltd., and to carry on the business of manufacturers, suppliers and distributors of and dealers in electric incandescent lamps, electrical accessories, devices, fittings, fancy goods, novelties, and all kinds of electrical articles and devices, &c. The first directors are: J. Ismay, Sterling House, Dagenham (chairman and managing director of Ismay Industries, Ltd.), F. J. Delbeke, "Brinsdale," Tenterden Grove, Hendon, N.W.4 (managing director of B.E.L. (Assignors), Ltd.), W. W. Kublin, 14, Roehampton Gate, Roehampton, S.W.15 (director of B.E.L. (Assignors), Ltd.), and J. P. Richards, 23, Park Crescent, Finchley, N. (director of Braemore Trust, Ltd.). The directors' borrowing powers are restricted to an amount not exceeding the nominal capital. Solicitors: Wm. Easton & Sons, 43, London Wall, E.C.

Murrays (Radio), Ltd.—Private company. Registered in Edinburgh November 2nd. Capital, £450. Objects: To carry on the business of dealers in all kinds of radio and television instruments, &c. The directors are: F. B. Murray and W. R. Murray, both of 4, India Buildings, Dundee, and Miss E. C. Murray, 6, Woodside Terrace, Dundee. Registered office: 137, Victoria Road, Dundee.

Auto Electric (Leeds), Ltd.—Private company. Registered November 4th. Capital, £2,000. Objects: To acquire the business of automobile electrical engineers carried on by J. H. Howe Law and F. B. Hirst at 8, Bankside Street, Leeds. The directors are: J. H. Howe Law (permanent governing director), Syke Lane, Scarcroft, near Leeds, and F. B. Hirst, Syke Lane, Scarcroft, near Leeds. Secretary: F. B. Hirt. Registered office: 3a, Meanwood Road, Leeds, 7.

Macy's Radio & Television, Ltd.—Private company. Registered in Edinburgh November 1st. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio, television, and telephonic equipment, &c. The subscribers are: H. A. Levine, 33-35, New City Road, Glasgow, and S. Schuster, 2, Marywood Square, Glasgow. H. A. Levine is the first director. Registered office: 45, Renfield Street, Glasgow, C.2.

Welding Construction & Repairs, Ltd.—Private company. Registered November 6th. Capital, £12,500. Objects: To carry on the business of welding engineers, &c. The directors are: J. H. Fountain, 6, Brim Hill, N.2, and F. A. Bell, Harefield, Woodcote Park Avenue, Purley, Surrey. Registered office: Cunard House, Leadenhall Street, E.C.3.

Edwin Stubbs, Ltd.—Private company. Registered November 6th. Capital, £500. Objects: To carry on the business of manufacturers of and dealers in radio receivers, transmitters, batteries, &c. The subscribers are: Mrs. A. E. Stubbs, 20, Desford Lane, Narborough, Leics., and J. T. Riddle, 101, Wigston Lane, Aylestone, Leicester. Mrs. A. E. Stubbs is a managing director for life. Solicitors: Bray & Bray, 5, Welford Road, Leicester.

S. D. & S. Electrical, Ltd.—Private company. Registered November 6th. Capital, £500. Objects: To acquire the business of an electrical, automobile, radio and general engineer, contractor and retailer, carried on by R. S. J. Dagnall as Sid Dagnall & Son, at 2, Fulham Road, Sparkhill, Birmingham. The directors are: R. S. J. Dagnall, and Mrs. J. M. Dagnall, both of 2, Fulham Road, Sparkhill, Birmingham. Registered office: 2, Fulham Road, Sparkhill, Birmingham.

West of England Radio & Finance Co., Ltd.—Private company. Registered November 5th. Capital, £2,000. Objects: To carry on the business of hire-purchase financiers, and in particular to finance the sale by way of hire-purchase, or deferred payments or otherwise of radio, television and electrical appliances, apparatus and fittings, refrigerators, &c. The first directors are: R. A. Bargate, 142, Fore Street, Exeter, and four others. Solicitor: R. Musgrave Hilton, 5, The Close, Exeter.

Barry Payne, Ltd.—Private company. Registered November 1st. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio and television sets, gramophones and sound reproducing machines, electric accumulators and batteries, &c. The directors are: R. C. Adams, 27, Thornby Avenue, Solihull, near Birmingham, and W. P. Jones, 51, High Street, Solihull, near Birmingham. Registered office: 5, Edmund Street, Birmingham, 3.

Mayfair Electric, Ltd.—Private company. Registered November 2nd. Capital, £100. Objects: To carry on business as merchants of and dealers in electrical appliances and electrical sundries, radio and television apparatus, refrigerators, ironmongery, &c. The directors are: F. M. Cullis and F. W. Cullis, both of 9, Daisy Lane, Fulham, S.W.6. Registered office: 15, New Bridge Street, E.C.4.

Radio & Sound Equipment, Ltd.—Private company. Registered November 3rd. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in radio, television, electrical, scientific and telephone apparatus and installations, &c. The directors are: M. Fisher and Mrs. E. Fisher, both of 3, Lytton Close, N.2. Secretary: A. Marks. Registered office: 48, Cranbourne Gardens, N.W.11.

S.B.C. Supplies, Ltd.—Private company. Registered November 3rd. Capital, £1,000. Objects: To carry on the business of retail general ironmongers, dealers in wireless, television and electrical apparatus, &c. The directors are: F. W. Batchelor, 355, Aldborough Road, Seven Kings, and two others. Registered office: 355, Aldborough Road, Seven Kings, Essex.

Roper Bros., Ltd.—Private company. Registered in Dublin October 30th. Capital, £6,000. Objects: To acquire the business of wholesale electrical suppliers now carried on as Roper Bros., of 5, St. Anne Street, Dublin. The directors are: W. T. Roper, "Elbani," Glenageary Road, Co. Dublin, and C. Roper, "Fona," Old Connaught Avenue, Bray, Co. Wicklow.

Returns of Electrical Companies

H. S. Phillips & Co. (Electrical Engineers), Ltd.—E. A. Savage, of 2, Coleman Street, E.C., was appointed receiver on November 1st, 1937, under powers contained in debenture dated October 9th, 1936.

Mid-Lincolnshire Electric Supply Co., Ltd.—The nominal capital has been increased by the addition of £150,000 in £1 ordinary shares beyond the registered capital of £550,000.

Neon (Portsmouth), Ltd.—A. J. S. Pratt, of 102, Victoria Road North, Southsea, was appointed receiver on October 29th, 1937, under powers contained in debentures dated March 10th and April 12th, 1937.

Oliver Pell Control, Ltd.—Charge on 2, Cambridge Place, Plumstead, S.E.18, dated October 29th, 1937, to secure £325. Holders: Kent Reliance Building Society, 3, Thomas Street, Woolwich.

Bungay Gas & Electricity Co., Ltd.—Debenture, charged on the company's undertaking and property, present and future, including uncalled capital, dated October 15th, 1937, to secure £6,000, and ranking *pari passu* with an existing debenture. Holders: Branch Nominees, Ltd.

Castle Fuse & Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated July 13th, 1937. All shares taken up. £12,998 paid, £2,000 considered as paid, £2 calls unpaid. Mortgages and charges: £1,402 8s. 3d.

Cox-Cavendish Electrical Co. (1924), Ltd.—Capital, £6,000 in £1 shares. Return dated August 20th, 1937. 4,344 shares taken up. £4,344 paid. Mortgages and charges nil.

Cox's Radio & Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1936 (filed July 28th, 1937). All shares taken up. £100 paid. Mortgages and charges nil.

Christy Brothers & Co., Ltd.—Capital, £225,000 in 75,000 preference and 150,000 ordinary shares of £1. Return dated August 11th, 1937. All shares taken up. £176,083 paid on 71,828 preference and 104,255 ordinary shares, £48,917 considered as paid on the remainder. Mortgages and charges nil.

Chislehurst Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated March 23rd (filed July 12th), 1937. 40,000 shares taken up. £30,000 paid, £10,000 considered as paid. Mortgages and charges nil.

Isle of Wight Auto & Electrical Services, Ltd.—Mortgage on properties in Newport, I.W., dated October 22nd, 1937, to secure all moneys due or to become due from the company to the Midland Bank, Ltd.

Radio Relays, Ltd.—Capital, £7,500 in 6,500 preference shares of £1 and 15,000 ordinary shares of 1s. Return dated July 15th, 1937. All shares taken up. £7,500 paid. Mortgages and charges, nil.

Smith Brothers (Caer-Conan) Wholesale, Ltd.—Capital, £1,000 in £1 shares. Return dated August 27th, 1937. All shares taken up. £1,000 paid. Mortgages and charges, nil.

Ever-Ready Radio Valve Co., Ltd.—Capital, £1,000 in £1 shares. Return dated October 13th, 1937. 970 shares taken up. £970 paid. Mortgages and charges, nil.

Falconar, Cross & Co., Ltd.—Capital, £7,000 in 3,500 preference and 3,500 ordinary shares of £1. Return dated September 29th, 1937. 3,300 preference and 2,002 ordinary shares taken up. £2 paid. £6,500 considered as paid. Mortgages and charges, £4,934 4s. 8d.

H. Church & Co. (Essex), Ltd.—Capital, £7,000 in £1 shares. Return dated July 9th, 1937. All shares taken up. £7,000 paid. Mortgages and charges at date of return, nil. Since registered £3,000 debentures all issued August 30th, 1937.

R. Cruickshank, Ltd.—Satisfaction in full on September 24th, 1937, of debentures authorised June 13th, 1902, and registered June 19th, 1902, securing £4,000.

John Holder & Co., Ltd.—Satisfaction to the extent of £200 on October 26th, 1937, of debenture dated January 14th, 1937, and registered February 3rd, 1937.

Derby Cables, Ltd.—Satisfaction in full on October 4th, 1937, of mortgage dated August 22nd, 1929, and registered August 28th, 1929. (According to the register of mortgages, the mortgage registered August 28th, 1929, originally secured all moneys due to bank.)

Mid-Cheshire Electricity Supply Co., Ltd.—The nominal capital has been increased by the addition of £400,000 in £1 unclassified shares beyond the registered capital of £300,000.

City Notes

The Kent Electric Power Co., which is owned as to 98 per cent. of the share capital by, and is under the management of, the County of London Electric Supply Co., Ltd., is issuing £2,000,000 of 3½ per cent. redeemable debenture stock at £96 per cent. The company was incorporated by Act of Parliament in 1902, and the present issue arises out of powers given to the company by the Kent Electric Power Act, 1937. Operating throughout a large part of the County of Kent, measured roughly from Gravesend to Canterbury, it supplies electricity in bulk to a number of local authorities and companies, to the Southern Railway for traction purposes, to industries along the Medway (including the big cement works) and distributes electricity in over seventy towns and villages, including Rochester and Chatham. Its issued share capital is 1,050,000 ordinary shares of £1, and the present issue is to be mainly devoted to the building of another capital generating station at Dartford, in conjunction with the Central Electricity Board. The recent Act of Parliament empowers the Kent E.P. Co. to issue debenture stock up to £2,500,000 and such further sums as the Electricity Commissioners may approve for the purposes of this new station. Of the present issue, £1,728,000 is to be devoted to the new station and the balance of £192,000 is to be applied to the general purposes of the company's business. The new Littlebrook station is to be a selected station under the South-East England Scheme of the Central Electricity Board and will be operated under the direction of that Board, who will purchase the whole of the electricity generated and will pay to the Kent E.P. Co. the total cost of production at the new station, including the interest payable in respect of this issue and in respect of further monies required for the station. The station will be situated at the mouth of the new Dartford Tunnel now in course of construction on the Kent side of the Thames. The first section of the station will have a capacity of 120,000 kW and the eventual capacity will be not less than 360,000 kW. The subscription list for the new debenture stock was opened and closed on Tuesday last; the issue was oversubscribed.

S. Smith & Sons (Motor Accessories), Ltd., report a profit for the year to July 31st last of £250,385, as compared with £175,579 in the preceding year, to which is added £70,608 brought in, making £320,993. A sum of £36,000 goes to reserve, against £30,000, and £25,000 (nil) is transferred to the research account. A final dividend on the preferred ordinary shares of 14 per cent., is recommended, making 21 per cent., for the year, and the dividend on the deferred ordinary shares of one-half the balance of distribution, after 7 per cent., to preferred holders, is equal to 50 per cent. for the year (against 37½ per cent.); £87,420 is carried forward. It is stated that since the date of the balance sheet the turnover has shown a satisfactory increase and the company is now able to deal with the larger demand which has arisen for its main products.

Crabtree Electrical Industries, Ltd., in its first report, covering the period November 21st, 1936, to October 31st last, includes the accounts of the operating subsidiary J. A. Crabtree & Co., for the year to July 31st. The trading profit of the subsidiary was £200,146, as compared with £140,423 in the previous year. After writing off £10,079 expenditure on plant, &c., providing for depreciation, income tax, N.D.C., and contingencies, there is a balance of £139,453, to which is added £37,504 brought in. Reserve receives £20,000, and dividends are paid amounting to £105,750, free of tax, leaving £51,033 to be carried forward. These dividends have been received by the parent company. The net sum available is £103,084. The ordinary dividend for the year is 10 per cent., plus 7½ per cent., cash bonus, and £11,927 is carried forward.

John I. Thornycroft & Co. report a net profit for the year ended July 31st of £109,422, as compared with £40,240 in the preceding year, to which is added £6,777 brought in. The directors propose to pay six years' arrears of dividend on the £200,000 6 per cent. cumulative preference shares, absorbing £72,000, which will bring payments up to June 30th last. This leaves a balance of £44,200 to be carried forward.

The Telephone & General Trust has placed privately £200,000 4 per cent. first debenture stock, 1957-67. This placing raises the amount of 4 per cent. stock in issue to the authorised total

Electrical Switchgear & Associated Manufacturers proposes to pay a final dividend of 10 per cent., less tax, making 16 per cent., for the year, as against a dividend of 7½ per cent. actual paid for the initial period to October 31st, 1936.

Burco, Ltd., has declared a final dividend of 12½ per cent., making 20 per cent. for the year. The company was formed in September, 1936, and carries on the business of engineers and manufacturers of electrical household appliances.

Guest, Keen & Nettlefolds have announced an interim dividend on the ordinary stock of 3 per cent., tax free (against 2½ per cent.).

The Electrolux Corporation has announced a quarterly dividend of 40 cents regular and 30 cents extra (same).

The British Electric Traction Co. is maintaining the interim dividend on the deferred ordinary stock at 2½ per cent.

Delhi Electric Supply & Traction has announced an interim dividend of 4 per cent. (unchanged).

Ward & Goldstone, Ltd., have declared an interim dividend at the rate of 10 per cent. per annum, less tax.

Stocks and Shares

TUESDAY EVENING.

FOREIGN politics are held responsible for the heaviness of tone that has spread over most of the Stock Exchange markets at the present time. As an outstanding exception, the list of gilt-edged securities shows pronounced strength. The gyrations of President Roosevelt arouse anxiety and uncertainty in the minds even of his own people, and, as one consequence of this, money from the United States is flowing across the Atlantic in order to find employment in British Government and kindred securities. Violent fluctuations in the prices of copper, tin, other base metals and various commodities, indicate the manner in which apprehension has spread.

To explain the reason for the depression in prices and the falling in values at the present time would require a page of this paper and the reader—possibly the writer as well—would be left, at the end of it, with no clear conception either of the root cause of the trouble or the necessary financial physic for its alleviation. Conditions change so quickly nowadays, however, that if there were to be, for instance, an outbreak of peace between China and Japan, or a settlement in Spain, either of these would undoubtedly bring an improvement to Stock Exchange prices. Meanwhile, business is running on very quiet lines. Save in the purely investment securities, initiative is taking little practical interest in stocks and shares.

Gilt-edged Strength

A variety of reasons is advanced to explain the buoyancy of the gilt-edged market throughout recent disturbing months. The weight of idle funds is a telling factor. Money for investment is generally supposed to be accumulating, in both public and private hands, as rapidly as ever. Political and business uncertainties are an obstruction to the normal flow of such money into the industrial and commodity share markets; they are a deterrent, also, to the spending of money in industrial development and expansion. Safety-first stocks remain one of the few outlets to suit the present cautious mood of investment. To put the matter another way, what is something like poison to the even slightly speculative markets, is meat to the gilt-edged section. In addition, no particular apprehension is felt as to the course of interest rates: neither do foreign funds show any disposition to leave these shores. An issue was made this week of £2 millions Kent Electric Power 3½ per cent. debentures at a price of 96.

Nevertheless, new issues are coming forward but slowly to augment the lessening supplies of stock.

The Rise in Prices

Many observers thought they saw the hand of the speculator at work in last week's acceleration of the rise in gilt-edged prices. This could be accounted for by widespread rumours regarding the imminence of financial operations by the Government. Treasury intentions are, of course, kept close-guarded. Nevertheless, the market is inclined to scout the idea of a Treasury conversion scheme or of further national borrowing at the present juncture. This feeling helped to check the rise in the early part of this week. Despite a reaction, however, prices of Government issues have made further headway. Public board and similar issues generally lag behind Government stocks, owing to the latter's popularity with the big institutions and with professional operators. The former have now begun to get under way. London Transport Board "A" and "B" stocks, at 116½ and 119½ respectively, are each 2 points better. Central Electricity Board issues show an upward tendency with the 4½ per cents of 1951-73 at 110, and the fives of 1950-70 at 113.

Debenture Stocks

Investment's search for safety-first securities has led naturally to a shortage in the available supply of sound industrial debenture stocks. Yields on the latter have come down to about the same level as those on Government issues. The average return on electricity supply companies' debentures is in the region of 3½ per cent. This rate can be obtained almost exactly from the 3½ per cent. debentures of the Mersey Power and the Northampton Electric companies. A slightly higher yield is provided by South Wales Electric and West of England Electric 3½ per cents., each of which is on offer at 97½. Of the London Power issues, the 3¼ per cent. stock can be bought at 93½, to yield just under 3½ per cent.; the fours are on offer at 107½, giving a return of nearly 3¾ per cent. Edmundsons 3¼ per cent. debenture stock, at 93½, pays £3 9s. 6d. on the money.

Industrial Markets

In the absence of approach to definite settlement in the war zones—or in America—business in industrial shares has had little chance to give signs of returning vitality. The tendency is still for prices to sag, despite indications that an end has been reached to last month's selling of everything marketable to meet speculative losses. The latter consideration encourages belief that the appearance of the hoped-for stimulus, from one source or another, should find industrial markets in good shape for recovery. The market in home electricity shares has lost none of its equanimity. Prices of electrical equipment and manufacturing shares show some fairly substantial falls on the week. General Electrics have lost 1s. 6d., to 78s., and Associated Electricals 2s. 6d., to 42s. 6d. Crompton Parkinsons are moderately active on the approach of the date of the report; good results are looked for, but the price of the shares has slipped back to 2½, having shed more than the previous week's half-crown gain. Brush, at 27, has also weakened with the near approach of the accounts. Arons, at 2¼ are ¼ lower. Chloride Electrical at 4 have lost the same fraction. Other dull spots are Automatic Telephone 40s. 9d., Crabtree Electrical 28s., and Siemens 30s.

Wall Street

The enforced selling of stocks and shares in London markets to pay for losses arising from the Wall Street slump seems to have exhausted itself. There remains much uneasiness over the cause of the trouble. Business activity in America has fallen away. It appears to be in no hurry to start climbing again. Complaint is insistent against New Deal measures which discourage business confidence and enterprise. A fortnight ago Washington altered the rules governing the margins required from speculators. A recovery in stock prices followed, mainly because of the inference that the authorities were at last concerned about the state of stock markets. This gave rise to hopes that Mr. Roosevelt might alleviate the trouble by relaxing some of the obstructions to the earning of profits in American industry. But no such step has as yet materialised. As is only to be expected in the circumstances, Wall Street remains in a state of jumpy nervousness, which is shared to some extent by operators with an eye on world trade, and our own export business.

Miscellaneous Matters

Cable and Wireless ordinary stock, at 64¼, has shed 3 points, and other communication stocks are dull. American Telephone and Telegraph has fallen from 155 to 148½, International "Tel. and Tel." from 7¼ to 7, and Western Union from 32 to 29. Marconi Marines at 31s. 3d., and Canadian Marconis 5s. 3d., have the same trend. Of the traction issues, British Electric Traction deferred is lower at 1075. Tillings have fallen to 56s. 9d. In the dollar group, Brazilian Tractions dropped 1¼ to 16¼ on pressure of sales from Amsterdam. The rubber share market has been heavy in sympathy with a fall in the price of the produce. American purchases of rubber have fallen off with the shrinkage in the demand for motor-cars in the United States, where a defeatist disposition appears to be making its mal-influence felt with increasing force.

Share List of Electrical Companies

Home Electricity Companies.

	Dividend. Nom.	Previous.	Last.	Price Nov. 9.	Rise or Fall.	Yield p.c. £ s. d.
Bournemouth and Poole	1	15	15	67/6	—	4 9 0
City of London	1	7½	7½	34/6	—	4 7 0
Clyde Valley	1	7	8	39/6	—	4 1 0
County of London	1	10½	10½	49/-	—	4 5 9
Edmundson's 7% Pref.	1	7	7	33/6	—	4 3 7
Do. Ord.	1	8	9	39/-	—	4 12 4
Elec. Dis. Yorkshire	1	9	9	41/6	—	4 6 10
Elec. Fin. and Securities	1	12½	12½	2½	—	4 15 3
Elec. Supply Corporation	1	11	12	52/-	—	4 12 5
Lancs Light and Power	1	7½	7½	33/-	—	4 11 0
Lond. Assoc. Electric	1	—	7	31/3	—	4 9 6
London Electric	1	7	8	35/6	—	4 10 2
London Power Deb. Red.	Stock	5	5	106½	—	4 14 0
Metropolitan	1	10	10	46/-	—	4 7 0
Midland Counties	1	7½	8	37/-	-6d.	4 6 6
Mid. Elec. Power	1	8	9	2½	—	4 4 8
North Eastern Electric Ordinary	1	6	7	32/-	—	4 7 6
Do. 7% Pref.	1	7	7	34/-	—	4 2 4
Northampton	1	10	10	45/-	—	4 9 2
Notting Hill 6% Pref.	10	6	6	14	—	4 5 9
North Met. Elec. Ordinary	1	10	10	48/3	-6d.	4 3 1
Do. do. 6% Pref.	1	6	6	30/-	—	4 0 0
Scottish Power	1	8	8	37/-	—	4 6 6
South London	1	7	7	32/-	—	4 7 6
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	21/-	—	7 2 10
Yorkshire Elec.	1	8	8	2	—	4 6 0

Public Boards.

Central Electricity, 1950–70	Stock	5	5	113	+½	4 8 6
Do. 1955–75	,,	5	5	115	—	4 7 0
Do. 1951–73	,,	4½	4½	110	+1	4 1 10
Do. 1963–93	,,	—	3½	98	—	3 11 5
London Elec. Trans. Gtd.	,,	—	2½	90	—	2 15 6
London & Home Counties, 1955–75	,,	4½	4½	109	—	4 2 7
London Passenger Transport, A	,,	—	4½	116½	+2	3 17 3
Do. do. B	,,	—	5	119½	+2	4 4 1
Do. do. C	,,	4	4½	80	+1	5 6 3
West Midlands Joint Elec. 1948–68	,,	—	5	112	—	4 9 3

Telegraph and Telephone.

American Tel. & Tel.	$160	9	9	148½	-6½	6 1 2
Anglo-Am. Tel. Pref.	Stock	6	6	115½	+1	5 4 0
Do. Def.	,,	1½	1½	28½	—	5 5 3
Cable & Wireless 5½% Pref.	,,	4½	5½	101½	—	5 9 5
Do. Ord.	,,	—	—	64½	-3	—
Do. Income	,,	—	—	101½	—	3 18 10
Globe Tel. & Tel. Ord.	10	4½*	5½*	16	—	3 8 8
Do. do. Pref.	10	6	6	14	—	4 5 9
Great Northern Tel.	10	20	20	38	-½	5 5 3
Marconi-Marine	1	10	7½	31/3	-⅛	4 16 0
Oriental Telephone Ord.	1	12*	12*	2 1/16	—	4 0 0

Home and Foreign Trams, etc.

Anglo-Arg. Trams First Pref.	5	Nil	Nil	6/3	—	—
Do. do. 2nd Pref.	5	Nil	Nil	3/9	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	19½	—	—
British Electric Traction Def. Ord.	,,	5	5	1075	-25	—
Do. do. Pref. Ord.	,,	8	8	168	—	4 15 5
Brazil Traction	$100	40 cts.	50 cts.	16½	-1½	—
Brit. Columbia Elec. Rly. Pce.	Stock	5	5	105½	—	4 14 9
Mexican Light Common	$100	Nil	Nil	2	—	—
Do. 1st Bonds	$500	5	5	33	—	—
Victoria Falls Ord.	1	20	12	3 1/16	—	3 18 5
West Riding	1	6½	10	2	—	5 0 0

Manufacturing Companies.

Aron Electricity Ord.	1	15	15	2½	-½	6 13 4
Assoc. Elec. Ord.	1	8	10	42/6	-½	4 14 1
Do. Pref.	1	8	8	37/6	—	4 5 3
Babcock & Wilcox	1	8	10	43/9	-⅛	4 11 5
British Aluminium Ord.	1	7½	10	47/-	—	4 5 1
British Insulated Ord.	Stock	20	20	4½	—	4 5 3
Brush Ord.	Stock	Nil	Nil	27½	-2	—
Callender's	1	15	15	4½	—	3 6 8
Do. 6½% Pref.	1	6½	6½	31/3	—	4 2 4
Crompton Parkinson Ord.	5/-	12½	12½	2½	-¼	—
Do. 8% Pref.	1	8	8	37/6	—	4 5 4
Electric Construction	1	7	10	1 1/16	—	5 10 4
Enfield Cable Ord.	1	25	25	5½	—	4 17 8
English Electric	1	Nil	Nil	31/0	-6d.	—
Do. do. Pref.	1	6½	6½	26/6	—	4 18 1
Ericsson Tel.	5/-	20	25	2 1/16	—	2 17 2
Ever Ready	5/-	35	45	28/6	-6d.	7 18 0
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	15	17½	78/-	-1/6	4 9 9
Henley's	5/-	30	15	1	—	3 15 0
Do. 4½% Pref.	1	4½	4½	1½	—	4 0 0
India-Rubber Pref.	1	5½	5½	21/3	—	5 3 6
Johnson & Phillips	1	7½	10	43/9xd.	—	4 11 5
Lancashire Dynamo	1	10	20	3½	—	5 18 6
Siemens Ord.	1	6	7½	30/-	-9d.	5 0 0
Telegraph Construction	£1	Nil	7½	2½	—	3 6 8

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1936

995. "Directional radio systems." A. F. Hegenberger. January 12th, 1935. (473420.)

4016. "Alternating-current electric generators having permanent-magnet excitation." Siemens-Schuckertwerke Akt.-Ges. February 11th, 1935. (473537.)

7092. "Electroplating ferrous metal." J. S. Nachtman. December 23rd, 1935. (473479.)

10238. "Electric condensers." E. Chiffey. April 7th, 1936. (473482.)

10565. "Insect electrocuting device." National Electric Screen Corporation. September 28th, 1935. (473646.)

10596. "Wireless and like receivers." W. S. Percival. April 9th, 1936. (473427.)

10616. "Electric irons." A. W. French. April 14th, 1936. (473428.)

10741. "Magnetic circuit and construction thereof." Continental Motors Corporation. April 13th, 1935. (473648.)

10746. "High-voltage direct-current systems." G. S. Innes, T. E. Allibone & Metropolitan-Vickers Electrical Co., Ltd. April 14th, 1936. (473649.)

10756. "Electron-discharge devices for use in television and like systems." Baird Television, Ltd., and C. Szegho. April 14th, 1936. (473554.)

10766. "Thermionic-valve circuits." V. Zeitline, A. Zeitline and V. Kliatchko. April 15th, 1935. (473650.)

10791. "Selector for electric connecting systems." M. B. Richter. April 14th, 1936. (Convention date not granted.) (473557.)

10838. "Mercury tube switches." A. F. Burgess (Adlake Co.). April 15th, 1936. (473603.)

10853. "Electrodes for electric-discharge devices." British Thomson-Houston Co., Ltd., and H. de B. Knight. April 15th, 1936. (473606.)

10854. "Telephone receivers." British Thomson-Houston Co., Ltd., L. B. Ault & W. A. Bocock. April 15th, 1936. (473607.)

10951. "Printing-telegraph receivers." E. E. Kleinschmidt. April 29th, 1935. (473614.)

10991. "Automatic tuning-control means for modulated carrier wave receivers." Marconi's Wireless Telegraph Co., Ltd. April 16th, 1935. (473618.)

11031. "Inductance coils." Kolster-Brandes, Ltd., and C. N. Smyth. April 17th, 1936. (473622.)

11032. "Radio receivers." Kolster-Brandes, Ltd., and C. N. Smyth. April 17th, 1936. (473623.)

11046. "Method of producing resistances." Radioakt-Ges. D. S. Loewe. April 18th, 1935. (473658.)

11087. "Electric-discharge lamps." British Thomson-Houston Co., Ltd., and H. R. Ruff. April 17th, 1936. (473626.)

11102. "Control of direct-current electric traction motors." English Electric Co., Ltd., E. A. Binney and P. L. Mardis. April 17th, 1936. (473367.)

11189. "Carrier-wave signalling systems." Telephone Manufacturing Co., Ltd., and L. H. Paddle. April 18th, 1936. (473662.)

11249. "Non-vibrating overhead electric cable." Vereinigte Aluminium-Werke Akt.-Ges. April 18th, 1935. (473561.)

11287. "Apparatus for automatic current regulation in alternating-current circuits." S. A. Stevens, L. E. Thompson and Westinghouse Brake & Signal Co., Ltd. April 20th, 1936. (473368.)

11326. "Electric arc convertors." Allgemeine Elektricitäts Ges. April 18th, 1935. (473433.)

11363. "Reflector fittings of electric lamps." F. W. Thorpe. April 21st, 1936. (473434.)

11487. "Electrical apparatus for transmitting indications or movements to a distance." Elliott Bros. (London), Ltd., and G. F. Shotter. April 22nd, 1936. (473563.)

11499. "Thermionic discharge devices." British Thomson Houston Co., Ltd. April 23rd, 1935. (473666.)

11778. "Electric motors." M. D. Craig and P. A. H. Mossay. April 25th, 1936. (473492.)

11814. "Induction coils for electrical circuits." Stratton & Co., Ltd., and G. S. Laughton. April 25th, 1936. (473493.)

12165. "Means for effecting tone compensation in loud speakers." Johnson & Phillips, Ltd., and D. Douet. April 29th, 1936. (473437.)

12731. "Capacitively controlled electrical apparatus." Capaswitch, Ltd., and C. G. Lancaster. May 5th, 1936. (473370.)

14137. "Sockets and socket mountings for electric plug connections." Ward & Goldstone, Ltd., and S. Goldstone. May 19th, 1936. (473440.)

14763/4. "Liquid insulating materials." British Thomson-Houston Co., Ltd. May 25th, 1935. (473441/2.)

18118. "Electrical signalling systems and apparatus." Telephone Manufacturing Co., Ltd., and L. H. Paddle. June 30th, 1936. (Cognate application 24127/36.) (473498.)

18175. "Thermally operated fire-alarm apparatus." Compagnie des Téléphones Thomson-Houston and L. J. J.-B. Cheneau. July 1st, 1935. (473373.)

18823. "Manufacture of dynamo-electric machines." English Electric Co., Ltd., and C. D. Jamieson. July 7th, 1936. (473499.)

21233. "Secondary emission electron multipliers." General Electric Co., Ltd., and W. H. Aldous. July 31st, 1936. (473571.)

21694. "Electric-welding apparatus." British Thomson-Houston Co., Ltd. August 6th, 1935. (473504.)

22592. "Electrical distribution panels." W. T. Henley's Telegraph Works Co., Ltd., and H. W. Breeze. August 17th, 1936. (473447.)

26312. "Variable electric resistances or potentiometers." Steatit-Magnesia Akt.-Ges. September 28th, 1935. (473508.)

28782. "Braun tubes." V. Zeitline, A. Zeitline and V. Kliatchko. October 22nd, 1936. (473385.)

30507. "Mounting of electrical apparatus." Télémechanique Electrique. November 20th, 1935. (473576.)

30961. "Electric amplifiers." J. J. Numans. November 13th, 1935 (473512.)

32554. "Electron-discharge devices." Standard Telephones & Cables, Ltd. February 4th, 1936. (473579.)

33727. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. December 10th, 1935. (473515.)

34464. "Control of electric-discharge devices." Naamlooze Vennootschap Philips' Gloeiampenfabrieken. December 18th, 1935. (Cognate application 34465/36.) (473390.)

34817. "Electrically driven compression refrigerating-machines." H. Goldner and W. Bock. December 20th, 1935. (Cognate application 34818/36.) (473517.)

34852. "Mounting of electrodes in electron-discharge tubes." Standard Telephones & Cables, Ltd. April 18th, 1936. (473452.)

34856. "Wave transmission networks." Standard Telephones & Cables, Ltd. December 18th, 1935. (473453.)

1937

1299. "Electric switches with temperature control, particularly for heating apparatus." Ehrich & Graetz Akt.-Ges. May 15th, 1936. (473456.)

2537. "Means for preventing radio interference from electric motors and the like." General Electric Co., Ltd., and N. R. Bligh. January 28th, 1937. (473396.)

3725. "Surfaces of high secondary-electron emission and methods of manufacturing such surfaces." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. February 10th, 1936. (473398.)

4561. "Metal vapour discharge tubes." R. P. Meisel. February 15th, 1937. (473583.)

4867. "Electro-optical image transmission systems." Electrical Research Products, Inc. March 4th, 1936. (473464.)

6086. "Magnetic assembly particularly for loudspeakers or microphones." Continental Motors Corporation. April 13th, 1935. (Divided out of 473648.) (473672.)

6962. "Electric-discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. March 12th, 1936. (473587.)

7287. "Measurements of voltage of galvanic batteries." Chloride Electrical Storage Co., Ltd. (Accumulatoren-Fabrik Akt.-Ges.). March 12th, 1937. (473527.)

8420. "Variable electric resistances or potentiometers." Steatit-Magnesia Akt.-Ges. March 23rd, 1936. (473402.)

9433. "Electric transformers." British Thomson-Houston Co., Ltd. April 2nd, 1936. (Addition to 470145.) (473404.)

10771. "Production of electrolytic condensers." R. Jahre (trading as R. Jahre Spezialfabrik für Konden-Satoren). April 15th, 1936. (473473.)

11170. "Rectifier comprising an ionic rectifying tube having an incandescent cathode." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 21st, 1936. (473530.)

12350. "Electric contact-making relays." H. Greenly. April 30th, 1937. (473589.)

16050/1. "Cathode-ray tubes." V. Zeitline, A. Zeitline and V. Kliatchko. April 19th, 1935. (Divided out of 11190/36.) (473673/4.)

17871. "Devices comprising ionic discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. June 29th, 1936. (473536.)

27589. "Cathode-ray tubes." V. Zeitline, A. Zeitline and V. Kliatchko. April 19th, 1935. (Divided out of 11190/36.) (473675.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 3rd:—

G.E.C. No. 570328. Class 6. Steam turbines, engines, boilers, internal-combustion engines, blowers, &c.—The General Electric Co., Ltd., Magnet House, Kingsway, W.C.2.

Varta (lettering and design). No. 571851. Class 8. Primary and secondary electric cells and batteries.—Akkumulatoren Fabrik Gesellschaft, Berlin, S.W., Germany (British representatives, Edward Evans & Co., 40-43, Chancery Lane, W.C.2).

Serf. No. 580163. Class 8. Electric batteries (not for medical purposes).—Marsham Tyre Co., Ltd., 67-69, Whitfield Street, W.1.

Philicolor. No. 580269. All goods in Class 8.—Philips Lamps, Ltd., 145, Charing Cross Road, W.C.2.

Monarch-Electric. No. 572154. Class 18. Electric fires and radiators, electrically heated wash boilers, and electric cooking stoves, water heaters and toasting stoves.—Eveson Bros. (1928), Ltd., Stanley Works, Wollescote Lye, Worcestershire.

Braybar. No. 577374. Class 18. Electric immersion heating installations for buildings.—George Bray & Co., Ltd., Bagby Works, Leicester Place, Leeds.

Rektifair. No. 579878. Class 18. Air-conditioning plant and air-conditioned cubicles.—Newcon Industries, Ltd., City Gate House, 39-45, Finsbury Square, E.C.2.

Cond-Air. No. 579999. Class 18. Air-conditioning plant.—Fractional H.P. Motors, Ltd., West Heath Works, Rookery Way, Hendon, N.W.9.

Saving Lives with Light

Writing under the above heading in *Electrical News and Engineering*, Mr. L. J. Schrenk, general superintendent of the Public Lighting Commission, Detroit, sets out the results of improved street lighting from the point of view of accident reduction. There were, he says, 111 night and sixteen day fatalities on thirty-one miles of streets in 1934 and 1935. On the same thoroughfares there were thirty-five night and five day fatalities in 1936 before the street lighting was improved, maintaining the ratio of 7 to 1 between night and day. Since better lighting has been provided, covering periods of from five to nine months on the different sections, there have been six night and five day fatalities, or a ratio of 1.2 to 1. Applying this ratio to the period from 1934 to the inauguration of improved lighting indicates that over a hundred lives might have been saved.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aberdeen.—Houses (50); A. B. Gardner, 11, Broad Street.
Amble.—Houses (50), Ivy Street; U.D.C. surveyor.
Banbury.—Houses (134), King's Road and Middleton Road estates (£49,894); Eadie & Co., contractors, Wolverhampton.
Barnet.—Cinema and car park; E. Simmons, chartered surveyor, 73, Chancery Lane, London, W.C.2.
Bath.—Hospital (£192,000), for the Royal National Hospital for rheumatic diseases.
Blackpool.—Houses (38) and garages, Devonshire Road and Rivington Avenue, for J. W. Lee, Ltd., Yarrow Road, Saw Mills, Chorley.
Boston.—Houses, Fydell Rowler estate, Spain Lane, York Street and South Square, for James Eley & Son, 1, Main Ridge, Boston; H. W. Weedon, architect, Phœnix Chambers, Colmore Row, Birmingham.
Brighton.—Swimming pool and houses, Dean Court Road; Saltdean Estate Co.. Ltd.
Bromley.—Houses (155), Bourne Vale estate; L. A. Culliford & Partners, 47, Essex Street, London, W.C.2. Houses (58), Dartmouth Road; H. Boot (Garden Estates), Ltd.
Burpham (SURREY).—Houses (150), New Inn Lane; A. E. Armstrong.
Cambridge.—Extensions to market (£8,460); borough engineer.
Carshalton.—School, Greenwrythe Lane (£17,774); Truett & Steel, Ltd.
Chelmsford.—Extensions to factory (£80,000), for Marconi's Wireless Telegraph Co., Ltd.
Chelsfield.—Houses (42), Woodside and Warren Road; Morrell (Builders), Ltd., 52, Grosvenor Gardens, London, S.W.1.
Cheshire.—School, Hazel Grove and Bramhall, near Stockport, for the E.C.; F. Anstead Browne, county architect, The Castle, Chester.
Clydebank.—Extensions to factory, Kilbowie Road (£200,000), for Singer Sewing Machine Co., Ltd., Sauchiehall Street, Glasgow.
Coventry.—School, Hill Farm estate, for the E.C.; C. Redgrave & Son, Barbican Chambers, Earl Street. School, Oakhurst site, Coundon, for the E.C.; R. Hellberg, architect, 13, Queen Victoria Road.
Dewsbury.—School, Temple Road (£35,120), for the E.C.
Dorking.—Nurses' home, County hospital (£10,492); C. H. Runnalls & Sons, Ltd.
Eaglesham.—Houses (90), for the Renfrewshire C.C.; J. Coutts, 8, Hunter Street, Paisley.
Ealing.—Shops and maisonettes, Ruislip and Mansell Road, for Price's Tailors, Ltd., Leeds.
Eastbourne.—Three shops and flats, Seaside; Hoadley's, Ltd.
Edinburgh.—Buildings, 38-44, Restdrig Road; P. R. McLarcy, 34, St. Andras Square. Hotel, cinema and shops, &c., West End Cross; Stewart Kaye, 14, Hill Street, Edinburgh, 2. Library, Dundee Street, for the Corporation; J. A. W. Grant, architect, 25, Rutland Square.
Glasgow.—Sports stadium (£60,000), Bothwell Street; S. Burton, junior, 266, Romfield Street. School, Knightswood; W. McCoig, 129, Bath Street. Extensions to factory, Mary Street, Port Dundas; A. M. Mitchell, West Regent Street.
Guildford.—Houses (14), Boxgrove Road; L. R. Hiscock. Theatre, Dapdime Crescent; F. L. Johnson, architect.
Halesowen.—Houses (36), near Gower Road; Field & Co., 6. Corporation Street, Birmingham.
Hamilton.—Houses, Whitehill, Burnside Lane, Ramsay's buildings, Dixon Street and Almada Street; W. H. Purdie, burgh surveyor, Municipal Buildings, Hamilton. Cinema; A. Mather, 102, Bath Street, Glasgow.
Harlesden.—Cinema, Craven Park Road, for Associated British Cinemas, Ltd.; W. R. Glen, architect, 30, Golden Square, London, W.1.
Hayes (MIDDLESEX).—Houses (81), Park Farm estate; F. J. N. Polkinhorne, U.D.C. surveyor, Town Hall, Hayes.
Hertford.—Extensions to factory, for Duromould Products Co., Gasehouse Lane.
Heywood.—Houses, Heap Bridge, in connection with the clearance scheme; A. Middleton, borough surveyor.
Inverness.—Houses (28), High Street, A. F. McKenzie, 12, Victoria Terrace.
Ipswich.—Aerodrome club, &c. (£7,631); Sadler & Sons. Two schools (£63,100); G. A. Kenney & Sons.
Irish Free State.—(CAHIR, Co. TIPPERARY).—School, for the South Tipperary Vocational E.C. of Clonmel; D. S. Doyle, architect, 43, Parnell Street, Clonmel. (ENNISCORTHY, Co. WEXFORD).—Houses (81); G. Flood, engineer to the Urban Council, Enniscorthy. (WEXFORD, Co. WEXFORD).—Schools; J. W. O'Sullivan, architect and engineer, 104, Grafton Street, Dublin, C.3.
Lanchester.—Houses (50), Clifford Bank; R.D.C. surveyor. Hospital (£160,000); W. and T. R. Milburn, architects, 17, Fawcett Street, Sunderland.
Leeds.—Houses (500), Halton Moor estate; W. J. Simms, Sons & Cooke, Ltd., and N. B. Bell & Co., Ltd. Houses (500), Parklands estate; Woolley Construction Co., Ltd. Houses (250), Seacroft estate; R. M. Thompson, Ltd. Cinema, Woodhouse Lane; Odeon, Ltd. News cinema, Corner House, Moortown; W. Hobson.
Lingfield.—School (£14,841); Cropley Bros., Ltd.
London.—(BETHNAL GREEN).—Tenements (61), Tent Street (£36,500); L.C.C. architect. County Hall, Westminster Bridge, S.E.1. (CHELSEA).—Extensions to departmental stores, Sloane Street, for Harvey & Nicholls; Williams & Cox, architects, 34, Henrietta Street, London, W.C.2. (HACKNEY).—Dwellings, Morning Lane (£18,236); Rowley Bros., Ltd., Tower works, Dunloe Avenue, N.17. Tenements (68), Warburton Square (£38,000); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. (HAMMERSMITH).—Factory for Brilliant Signs, Ltd., Stowe Road. (HAMPSTEAD).—Lido, Parliament Hill Fields (£33,660); Gee, Walker & Slater, Ltd. (ST. MARYLEBONE).—Flats (54), Richmond Street (£28,750); L.C.C. architect, County Hall, Westminster Bridge, S.E.1. Extensions to Institution (£31,492); C. P. Roberts & Co., Ltd., 31, High Holborn, W.C.1. (STEPNEY).—Flats (240), Pennington Street (£145,650); L.C.C. architect, County Hall, Westminster Bridge, S.E.1.
Malden.—Central and branch libraries (£23,000); borough engineer.
Manchester.—Cinema, Church Street, Newton Heath, for A. Snape, 13, St. Ann's Street; J. A. Dargie, architect, 139, Chapel Street, Salford. Offices and extensions to factory, Altrincham Road, Northen Etchells, for J. Crampton & Co., Ltd.; R. & T. Howarth, contractors, Crossfield works, Rochdale.
Middleton.—Houses, Acresfield Road, Guildford Road, and Ashbourne Avenue; The Pime Estates, Ltd., builders, Snipe Estate Office, Audenshaw, Manchester. Houses (26), Heywood New Road; P. Roydes & Co., Ltd., builders, Alkington.
Montgomeryshire.—School, Welshpool, for the County E.C.; Llewellyn Phillips, director of education, County Education Offices, Newtown.
Motherwell.—Cinema, Brandon Street; Odeon Cinema Holdings, cinema proprietors, Cornhill House, Bennett's Hill, Birmingham.
Mottingham.—Shops, Kimmeridge Road; Knight & Co., Ltd., & Langford Property Co., Ltd.
Newcastle-on-Tyne.—Houses (20), Sherfield Drive; F. E. Maughan, builder, Cochrane Park Drive, Newcastle-on-Tyne.
Northampton.—Houses (54), Kettering Road; Chowns, Ltd. Extensions to Transport depot (£14,909); W. E. Cockerill & Sons.
Northumberland.—School, Whitley (£15,633), for the County E.C.
Nottingham.—Hotel at the corner of Gordon Road and Gordon Square, West Bridgford, for Hansons, Ltd.; Wheeler & Co., architects, Eastwood, Nottinghamshire.
Nottinghamshire.—County offices, Nottingham, for County Council; R. Preston, heating engineer. Library, West Bridgford, and police station (£3,750), West Bridgford; county architect.
Penrith.—Additions to Grammar school (£9,200); J. Kitchen, builder, Brunswick Road.
Plymouth.—Houses (14), Ashbirnham Road; T. H. Mitchell. Houses (26), Saltburn Road; C. Jope.
Port Glasgow.—Houses (132), East End; Geo. Arthur & Son, The Cross, Airdrie.
Redcar.—Houses (12), Broadway; Westfield Estates, Ltd. Houses (12), Raby Road; T. Robinson & Son. Bus station, High Street; United Automobile Services.
Rotherham.—Shops and offices, Upper Millgate (£47,000), and extensions to transport depot (£20,000); borough engineer.
Rothwell.—Houses (32), Woodlesford Lane; A. M. Hopton & Son, Marsh Street.
Rugby.—Houses, Bilton Place estate; Clark & Sillitoe, surveyors, 23, Trinity Churchyard, Coventry.
St. Helens.—Houses (140), Ramford Street site No. 46; A. P. Statham, borough engineer, Town Hall.
Saddleworth.—Houses, Shaws and Heathfields, Uppermill; U.D.C. surveyor.
Sheffield.—Houses (27), Brooklands Avenue; T. W. Kowles, Ltd. Houses (21), Hall Road; S. Dencher. Houses (118), Parsons Cross (£47,024); W. Malthouse, Ltd. Houses (27) and flats, Bolehill Road; J. C. Mason. Offices and showrooms, Fargate; City & Town Buildings, Ltd. Extensions to hospital, Infirmary Road; Royal Infirmary Board.
Shifnal.—Cottage Hospital (£10,000), for Board of Management; A. T. Butler, architect, Priory Street, Dudley.
Staffordshire.—School, Cherry Orchard, Lichfield, for the County E.C.
Standish-with-Langtree.—Houses (50), Wigan Lower Road, Standish; U.D.C. surveyor, Council Offices, Standish.
Stockport.—Houses (194), Walnut Tree Farm site; W. F. Gardner, borough surveyor, Town Hall.
Sunbury-on-Thames.—Houses (24), Sutherland Avenue site, Nursery Road; A. J. Buttress, U.D.C. surveyor, Council Offices.
Sunderland.—Alterations to the Theatre Royal, Bedford Street; H. Waller, builder, Back Waller Street, Newcastle-on-Tyne.
Surrey.—Clinic, Worple House, Barnes (£6,363), and nurses' home, County hospital, Epsom (£82,500); county architect, Kingston-upon-Thames.
Thorne.—Houses (130). (£43,130); R.D.C. surveyor.
Tipton.—Houses, Powis Avenue and Walker Street; C. R. Gallie, housing director, Municipal Buildings, Sedgley Road West.
Todmorden.—Houses (37), with café and shops, Heptonstall Slack; John Moorhouse & Co.
Torquay.—Houses (188), Watcombe estate; borough engineer.
Wallsend-on-Tyne.—Houses (48) in flats, Low Willington estate; D. Gateshill, builder, Croft Road, Blyth.
Warley (BIRMINGHAM).—Cinema, fronting on Birmingham-Wolverhampton Road, for J. H. Lewis; T. Elvin & Sons, Ltd., builders, Soho Road, Handsworth.
West Bromwich.—Town Hall (£145,000); Mr. Fillmore, architect.
West Thurrock (ESSEX).—Factory buildings, for Tunnel Asbestos Cement Co.
Whyteleafe.—Extensions to County girls' school (£21,509); Uden & Co., Ltd.
Worthing.—Cinema for Liverpool Gardens (Worthing), Ltd.; F. E. Bromige, architect, 84, Regent Street, London, W.1.
Yeadon.—Hangar, &c., Leeds-Bradford aerodrome (£28,300); Wm. Thompson & Sons.
York.—Extensions to hospital (£93,498); F. Shepherd & Sons, Ltd.